THE BRICKBVILDER AN ARCHITECTVRAL MONTHLY

Engineering Library
NOV 3 1916

OCTOBER
1916

DEVOTED TO THE ART AND SCIENCE OF BVILDING

ROGERS AND MANSON COMPANY PVBLISHERS

TIFFANY

THE GUARANTEED

ENAMEL BRICK

1203 Chamber of Commerce Bldg.

Chicago

ST. LOUIS TERRA COTTA CO.

Manufacturers of

Architectual

AND

Ornamental

TERRA COTTA

IN ALL COLORS

BRICK, TERRA COTTA AND TILE COMPANY

M. E. GREGORY, Proprietor

CORNING - - NEW YORK

Manufacturers of

Architectural TERRA COTTA

New York Office - 52 Vanderbilt Ave.

HAY WALKER BRICK CO., INC.

Agencies in all the Principal Cities

Established 1856

Henry Maurer & Son

Manufacturers of

HOLLOW TILE

Fireproofing Materials

OF EVERY DESCRIPTION

Flat and Segment Arches
Partitions, Furring, Etc.

Hollow Wall Blocks for Buildings

GENERAL OFFICE

420 East 23d Street - New York

Philadelphia Office, Penna Building

Works . . . . . . Maurer, New Jersey

DOMENICO FONTANA

ITALIAN ARCHITECT. BORN 1543. DIED 1607. ARCHITECT OF WORK AT ST. PETER'S, ROME, INCLUDING COMPLETION OF MICHELANGELO'S DOME AND TRANSPORTATION AND ERECTION OF OBELISK IN THE COURT

THE BRICKBVILDER

VOLUME XXV | OCTOBER, 1916 | NUMBER 10

The Dome of St. Peter's, Rome.

A STUDY OF ITS STRUCTURAL SYSTEM.

By RICHARD FRANZ BACH.
Curator, School of Architecture, Columbia University.

I.

RENAISSANCE architectural history is writ large in the fabric of St. Peter's. From the attempt on the part of Rossellino in 1450 under Pope Nicholas V to rebuild the Gothic cathedral, to the completion of the colonnaded atrium by Bernini, and the lantern and altered dome contour by Della Porta and Fontana is a space of over one hundred and fifty years, comprising the full sweep of the *risorgimento* from faintest traceable beginnings to the Gargantuan orders of Michelangelo that contained the germ of a megalomaniac decline. The crowded chapters of the history of this building, beginning 1506, fall, however, within the resplendent pontificate of the warlike Julius II, whose sepulcher it was first designed to house. The story of the building as a whole cannot here be given space.* It carries us through a succession of memorable careers, each at its zenith and each at some time granted the sole guidance of the undertaking: Rossellino (1409-61), Bramante (1444-1514), Giuliano da San Gallo (1445-1516), Raffaelle (1483-1520), Fra Giocondo (1435-1515), Peruzzi (1481-1537), Antonio da San Gallo the Younger (1482-1546), Michelangelo (1474-1564), Del Vaga (1500-47), Ligorio (1530-86), Vignola (1507-73), Della Porta (d. 1601), Fontana (1543-1607), Maderna (1556-1629), Bernini (1598-1680), more than half the number being responsible for new plan suggestions in the course of which the conception of a mausoleum for the pope was early lost in that of a monumental central church of Christendom. Bramante's plan formed the nucleus of most that followed, and its relegation has often been regretted by students of the work. From the first the scheme of Julius II had been vaguely that of a domical building, and the dome feature as a central motive retained its vitality to the end, abetted by the completion of the fine project of Brunelleschi at Florence, as well as the example of numerous other domed churches in Italy, which gave to the motive a growing vogue of importance as a dignified crowning mass for a building of churchly use. As design succeeded design, a rivalry arose between the Greek and Latin cross type of plan for the entire edifice, — the first favored scheme by Bramante being of the former, — the two forms then gaining support in alternation, until the quarrel was seemingly set at rest by Michelangelo, whose plan was fully executed, only to be modified in turn by Maderna's additions to the eastern arm,† which restored the Latin cross type at the expense of the effectiveness of the dome, which as a result of the increased nave length cannot be seen to advantage for a distance of over 1,300 feet beyond the front of the building.

Dome of St. Peter's, Rome

Bramante's dome project promised a "Pantheon hung in heaven," its base forming an articulated drum surrounded by a peristyle as its principal motive, the whole surmounted by a lantern, and the diameter of the plan being equivalent to that of the ancient

*See bibliographic note, p. 254.

†St. Peter's main façade faces eastward, as in the early basilicas, and contrary to the usual mode of orientation involving a "west front."

Roman building — about 142 feet. Bramante completed the four great piers and pendentives and had, before his death in 1514, turned the enormous arches that spanned them and were to form the primary square (resp. octagon) of support. Raffaelle's work, and that of a number of others, was chiefly on paper, for the project never ceased to attract the pencils of a large number of fertile brains, whose qualifications were far beneath the requirement for bringing the work to execution.

The task was distinctly beyond Raffaelle's grasp. Although interested to the extent of leaving well studied plan solutions, Peruzzi's contribution and also that of both San Gallo was largely that of making good the defects due to Bramante's haste, for the latter was anxious to gratify Julius II by completing at least the essential portion of the building that was to shelter his tomb, upon the sculptural decoration of which Michelangelo meanwhile was wasting valuable years. The piers were found to be too weak and the arches had begun to show fissures. Fortunately building activity did not go forward on such large undertakings with the speed required in more recent times; calamity would surely have followed any further execution on Bramante's understructure, erected upon hastily made ground, bearing piers of insufficient and inferior masonry.

Michelangelo's work upon the building dates from 1546. He repeatedly maintained that he could do no better than carry to completion the splendid work of Bramante; although the two had not been upon very amicable terms due to certain differences in regard to the Sistine Chapel decorations, Michelangelo freely admitted Bramante's high architectural grasp. He adopted a simplified suggestion from his predecessor's Greek cross plan, but not without due care for the strength of his piers. These had originally been treated with large niches on all faces; San Gallo had filled them in for the most part to gain the additional bearing surface and volume. It is also recorded that sunk masses of masonry with interconnecting arches were built beneath two of the piers, in order to equalize the foundations, which in the other two bore directly upon parts of the old Roman circus.

Michelangelo is chiefly responsible for the dome, its construction and massive effectiveness, but the actual silhouette and contour are due to a remodeling of Michelangelo's design in wood by Della Porta and Fontana, tending toward a more pointed section. Michelangelo set his mind singly upon the completion of this masterwork, as did Brunelleschi upon the Florentine cupola before him, and as though the myriad commissions for statues and paintings and other buildings did not exist. Like his predecessor, he, too, was beset with intrigues and obstructionism to the end. For seventeen years, having accepted full direction of the work at the age of seventy-two, and throughout refusing all remuneration, he conducted the undertaking almost single handed, as he did also the Sistine frescos and a multitude of other commissions, leaving no broadcast heritage to pupils fostered in his powerful mode of art interpretation, and thus largely contributing to the alien mannerisms that helped to hasten the decline of a great period.

While the building as a whole is so generally regarded as a failure, due to its simplicity exaggerated by a giant scale of all minor motives as well as of leading lines, its egregious orders and the bungling additions of Maderna, whom Ferguson delights in calling "a very second-class architect," the dome itself cannot be censured in this respect. In this feature the simplicity is duly varied by structural unity gained in the exterior projection of ribs, carried down by the strong parallelism of the peristyle buttresses below and finding a fitting finial in the detail of finely wrought lantern above. Considered feature by feature, however, we may find an incongruity of mouldings in the treatment of the three rows of windows in the outer surface or in the projections of the attic wall set forward above the coupled columns of the peristyle as in a Roman *ressaut*. The extension of the nave eastward destroyed the near view of the dome, giving

Dome of St. Peter's, Rome. Elevation of entire building as completed, including final dome contours, altered front, and atrium with colonnade
(From Letarouilly and Simil)

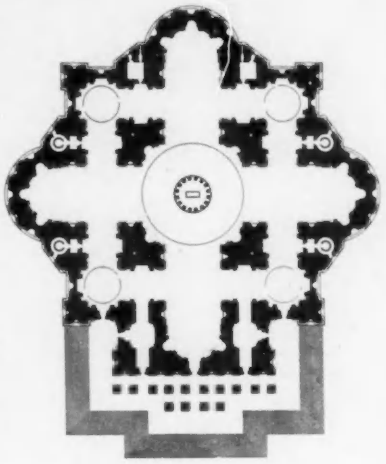
from that direction the impression of a giant "with head pressed down between his shoulders"; but the full curve of its contour is adequately to be gauged on the axis of either transept arm, on that of the principal apse, or from the direction of the intermediate angles. Its substructure does not profit by its garment in the form of a 108-foot order surmounted by a further height of 39 feet in an uninteresting attic motive. A hopeless attempt at variety is witnessed in the frames of windows in two stories between grouped pilasters and in four stories within the groups, the motives being of negligible æsthetic value, except as a deterrent may have such value. One senses to a certain degree the curious handicap which so readily characterizes Michelangelo's minor works in the architectural field — the Farnese Palace cornice being a shining exception — a field which according to his repeated assurances he would gladly have eschewed for that of sculpture — a curious lack of taste difficult to analyze or explain, unless it be called lack of architectural sense or poise, and which is exemplified in remarkable fashion in the Porta Pia in Rome, to which, fortunately, the name of Pirro Ligorio (who together with Vignola assisted Michelangelo on the dome project when the climbing became too difficult for his years) has also been attached.

Yet it may be truly said that the dome seen as a whole is not lacking in impressiveness and majesty, both within and without — qualities not generally within the compass of human comprehension in this example upon first view, and not even carried home to us when we are told that the Corinthian capitals bear 7-foot acanthus leaves and that St. Luke in one of the pendentive mosaics writes with a pen at least as long. When regarded from this angle of scale alone, one is prompted to favor the suggestion that uniformed vergers be obliged to wander about the building carrying the accepted 10-foot scale wands, as an index of the "human scale" which has been so consistently disregarded throughout.

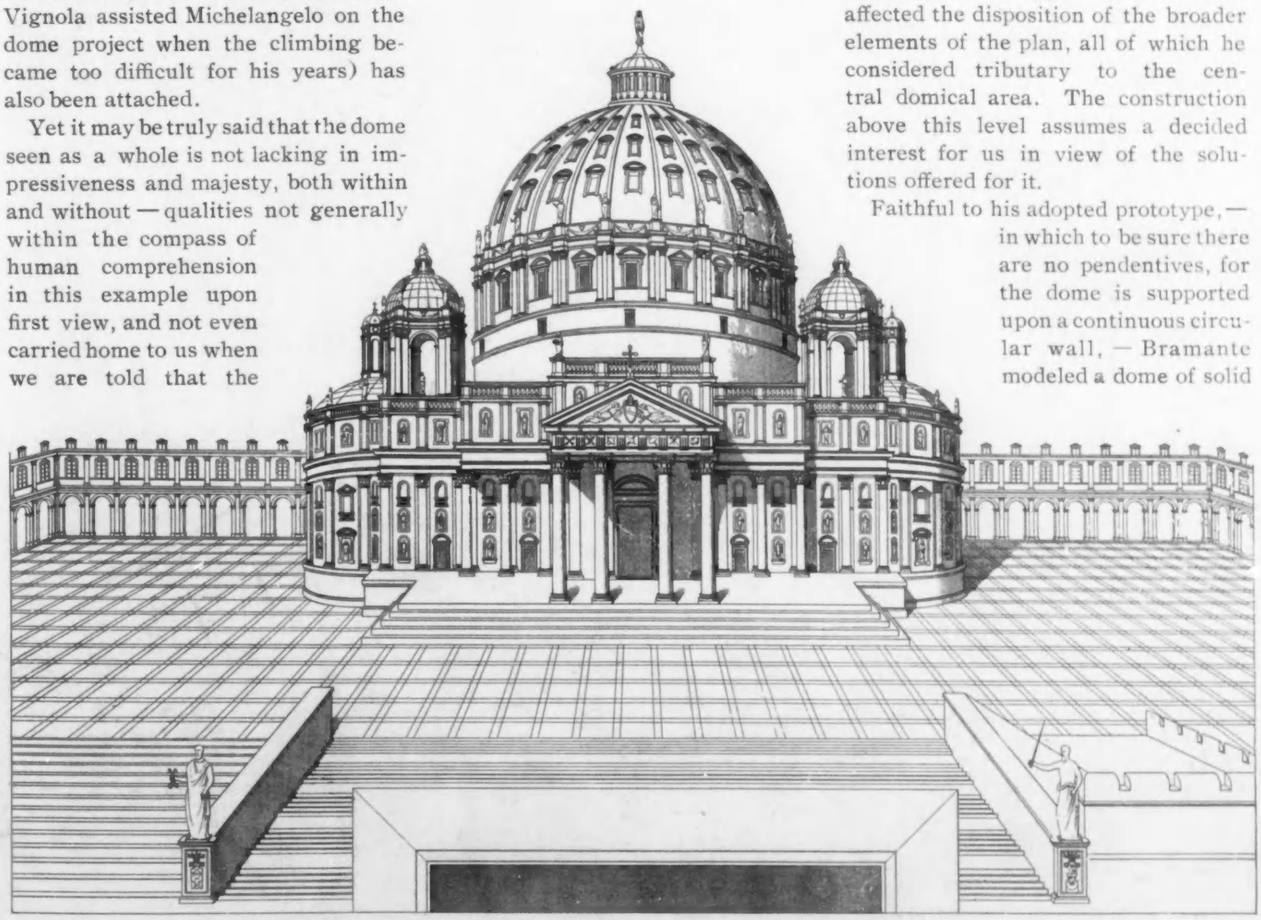
II.

Logically the plan of the church is mainly dependent upon its central feature, which so insistently prompted the Greek cross plan type. Apart from the damaging additions, Michelangelo's solution was that of a nave and flanking aisles intersected by a similar arrangement, the dome appearing as a culmination at the crossing. The dimensions of the dome space were immediately fixed by Bramante's desire to emulate the Pantheon; the piers, cross arches, and pendentives being in position, however faulty; the abutting construction likewise offered but little opportunity of variation except in repetition of bays, at least up to the level of the final circle closed by the upper pendentive arcs, and Michelangelo's changes therefore affected the disposition of the broader elements of the plan, all of which he considered tributary to the central domical area. The construction above this level assumes a decided interest for us in view of the solutions offered for it.

Faithful to his adopted prototype, — in which to be sure there are no pendentives, for the dome is supported upon a continuous circular wall, — Bramante modeled a dome of solid

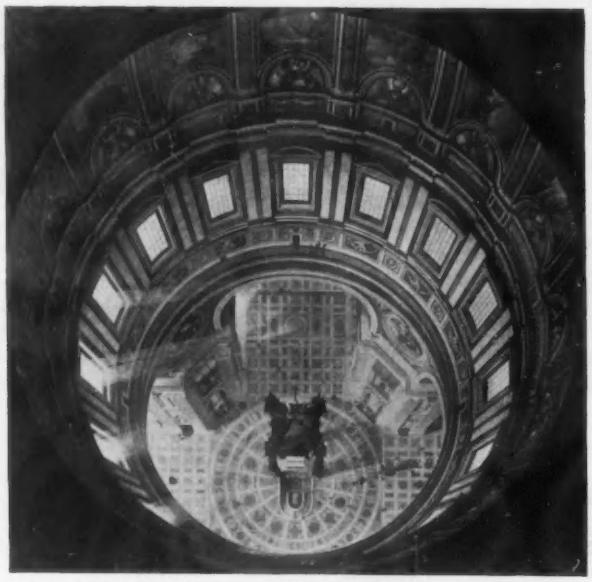


Dome of St. Peter's, Rome
Plan of Michelangelo's design



Dome of St. Peter's, Rome. Michelangelo's design for entire building. (*From Letarouilly and Simil*)

masonry and of semicircular section, surmounted by a lantern frankly suggested from Brunelleschi's in Florence. Antonio da San Gallo likewise proposed a solid, single shell dome 42 feet thick at the base and 17 feet thick at the crown. One marvels at the intentions of both when it is considered that the very skeleton began to give way of its own weight, before even the drum had been begun.



Dome of St. Peter's, Rome. View looking downward to altar from oculus

The Florentine example* should be regarded as a precedent and inspiration throughout the whole history of St. Peter's dome. It embodied marvelous structural results, the fruit of many scores of experiments, and the concrete evidence of study of Italian examples. Bramante and Michelangelo were both familiar with this dome in detail, but each had also studied ancient Byzantine and other examples in Italy; San Gallo is even known to have had a sectional study of Hagia Sophia at Constantinople. But while Bramante was a firm adherent of the Pantheon as a particular model in this case, Michelangelo was not similarly bound, but distinctly favored Brunelleschi's results and processes. In fact, it may be said that the final result is a sort of precipitate resulting from a composition of the elements of the Pantheon and Hagia Sophia, through the medium of Italian Byzantine examples, but always with the direct influence of Brunelleschi's Florentine dome. In this connection we have the quotation referring to Florence, "Like you I will not build," and again in one of Michelangelo's sonnets, "I shall surely make thy sister larger but not more beautiful than thou."

The desire for height and exterior impressiveness prompted Bramante to raise his proposed dome upon a peristylar drum set high on a base which, although corresponding to the circular wall of the Pantheon, did not offer the same structural advantages, because of its lighter construction and its elevation, the latter being such as to reduce measurably the effectiveness of his abutments for the dome in the body of the building and probably to make cinctures imperative in the dome itself if this were to retain its semicircular section. He returned to his prototype, however, in the stepped circular buttressing mass on the lower haunch of the dome, but set the spring of the latter considerably higher in the edifice, although much below the top of the drum, which in turn he allowed to rest directly upon the pendentives. Some dimensions might be noted in this connection. Allowing for later efforts to counteract weakening, the piers of Bramante forming the main support are giant shafts of masonry, trapezoidal in plan, measuring about 61 feet in their greatest width and 39 feet on the shorter sides, thus achieving a perimeter — with due allowance for projections of about 285 feet — providing an area of support capable of bearing six and three-quarter thousand tons, and giving, despite their uncertain history, a splendid effect of structural stability. The form of the piers gives the pendentives a direct bearing and permits a slight projection beyond the inner pier face.

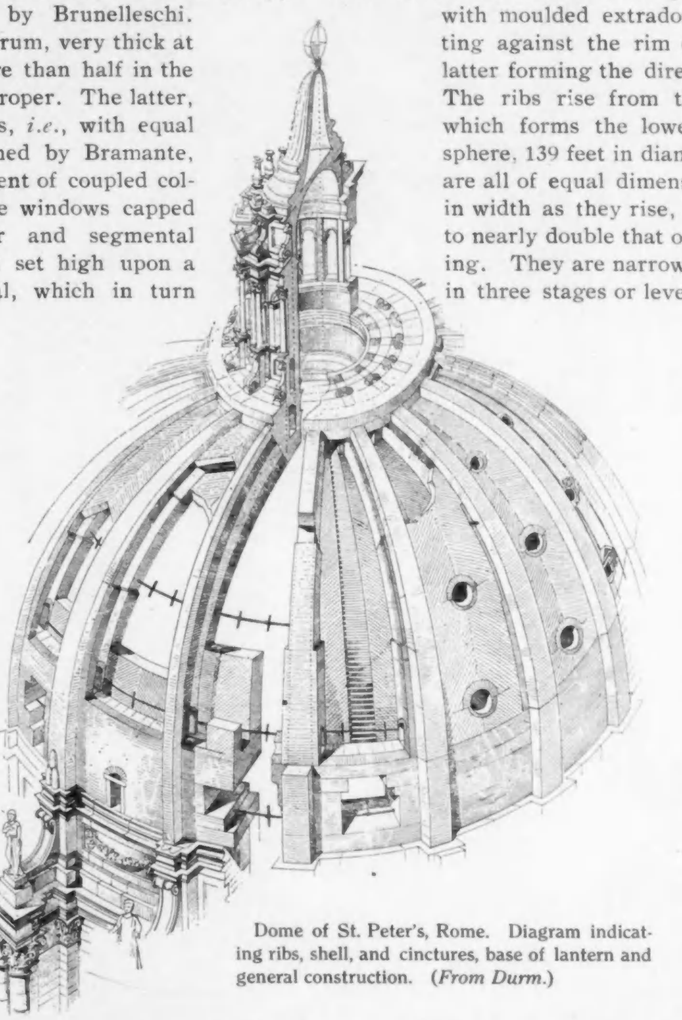
Dome of St. Peter's, Rome. Section showing shells and location of original cinctures, at left
Half section showing location of chains added to correct ruptures in 1743–1748, at right
(From Durm)

Michelangelo's avowed approval of Bramante's work seems, however, to have been insufficient to lead him to execute it unaltered. In fact, we are driven to the conclusion that he considered the dome of Bramante a risky undertaking, since his piers and arches had already given such a poor account of themselves, and any strengthening of these by means of additional masonry applied as a cloak to their exterior to carry the enormous weight of the solid dome would gain for them a further

*The Dome of S. Maria del Fiore, Florence, is discussed and illustrated in detail in THE BRICKBVILDER for August, 1916, pp. 209-215.

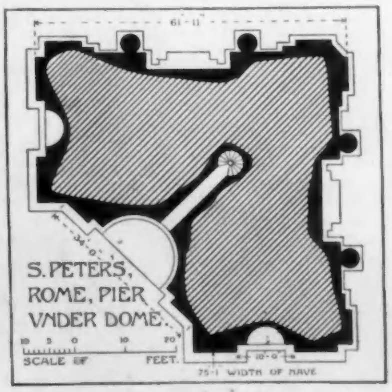
supporting strength in inferior ratio to the material added, besides destroying the effectiveness of the original design. Michelangelo therefore devised a different structural system, whose precedent it is not difficult to discern, abandoning the Pantheon suggestion, using a more pointed section, and basing the whole upon the shell type of construction elaborated by Brunelleschi. He retained the peristylar drum, very thick at its base, but reduced by more than half in the entablature of the peristyle proper. The latter, instead of being continuous, *i.e.*, with equal intercolumniations as designed by Bramante, he planned as an arrangement of coupled columns alternating with large windows capped with alternately triangular and segmental pediments. The order was set high upon a continuous circular pedestal, which in turn rested upon a flat octagon whose base was level with the roof line and bore directly upon the pendentives. Above the peristyle appeared a heavy attic with inverted consoles leading its frontal plane back to the actual circle of the dome. The coupled columns represented the ends of a series of sixteen radiating buttressing walls, the attic story broken out above, each leading the eye upward to the sixteen strongly projecting and thoroughly well profiled ribs forming the skeleton of the cupola.

In Michelangelo's lifetime the work was completed to the dome springing only, the dome itself and the graceful lantern were executed posthumously, but closely followed his design, the inverted consoles above the attic having been omitted. It is noteworthy that the detailed model left by Michelangelo comprised a system of three shells,—two arranged as in the finished building, the third shell being of semicircular section with large oculus in its crown and having nothing to do with the structural work of the fabric beyond helping to counteract by its weight the lateral thrust of the other shells and providing heavier masonry at their spring. It demonstrated his sanction of Bramante's inspiration from the Pantheon for interior effectiveness — a quality which he had found lacking in the Florence cathedral. This inner shell was not executed, and since the model was completed at least six years before Michelangelo's death, it has been surmised that at the last he himself may have decided upon its elimination. Della Porta and Fontana later gave the dome an even more pointed section.



Dome of St. Peter's, Rome. Diagram indicating ribs, shell, and cinctures, base of lantern and general construction. (*From Durm.*)

As completed, the dome consists of a framework of sixteen ribs of solid Tivoli stone projecting from the vault with moulded extrados or summits and abutting against the rim of an oculus above, the latter forming the direct base for the lantern. The ribs rise from the solid mass of brick which forms the lower quarter of the hemisphere, 139 feet in diameter at its spring; they are all of equal dimensions, are much reduced in width as they rise, but in thickness increase to nearly double that of the wall at the springing. They are narrowed, as they rise upward, in three stages or levels. There are no bonding courses of any kind between them, but they extend through the full thickness of both shells, which are not concentric as in Florence. Passages are contrived by cutting steps in the extrados of the inner shell, and a circular passage is also arranged for beneath the lantern base between the shells, using the back of the inner one as a floor. Both shells are of brick laid in herringbone fashion, the void between them being lighted by three rows of loopholes. The total height of the structure is 435 feet. The lantern has almost the same dimensions as Brunelleschi's, but is of much heavier materials and is supported on a vault of slighter section, the rim diameter being also somewhat less. Buttresses and windows in the lantern, which has also been designed upon a sixteen-sided plan, correspond to those in the peristyle.



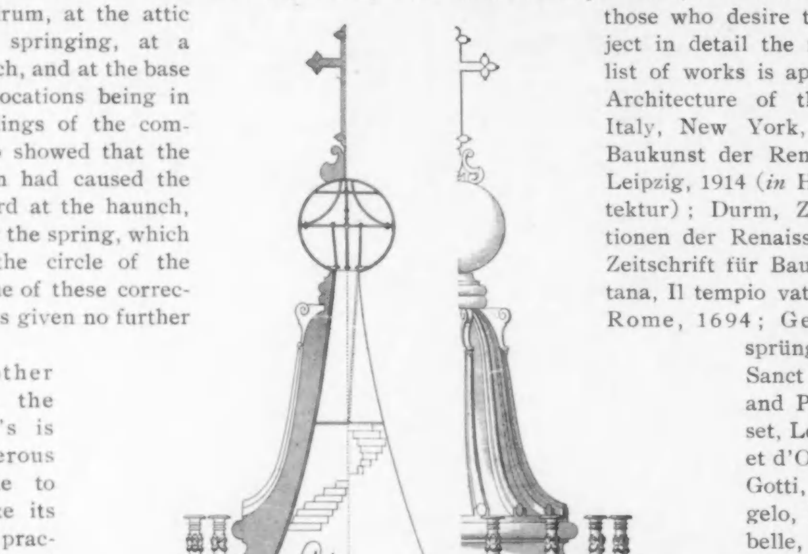
(*From Simpson*)

Michelangelo's structural system — however true or false his dome may be according to those who insist upon absolute structural integrity and the full and frank outward expression of all structural expedients — evidently did not stand the test of time, for it showed signs of cracking in drum and dome alike shortly after his death. No little of this damage may have been due, to be sure, to the fact that the whole of the dome was completed under Michelangelo's successors within a period of twenty-two months — a decided contrast to earlier

tardiness — and the magnitude of the undertaking is seen in that eight hundred men were employed about the work during this space of time, and these often worked at night. In such haste inferior materials crept into the construction and these brought about unequal consolidation of the mass. The defects were at first ignored and glossed over by papal request in a treatise by Fontana. In 1742–47, however, greater danger impended, and an investigation by the three foremost mathematicians of Europe at the time brought serious ruptures to light. Poleni then made a detailed study on the basis of which Vanvitelli was instructed to insert in the dome five cincture chains. Two had been built into the solid masonry at the dome springing, and at one-half its altitude; being embedded in the construction, it was not possible to ascertain if they, too, had given way. The new chains were placed respectively at the base of the drum, at the attic level, at the dome springing, at a point above the haunch, and at the base of the lantern, the locations being in accord with the findings of the committee of three, who showed that the weight of the lantern had caused the ribs to buckle outward at the haunch, thus directly affecting the spring, which in turn disrupted the circle of the drum. Since the time of these corrections the structure has given no further trouble.*

Like many another large undertaking, the dome of St. Peter's is fraught with numerous indications of value to those who now make its study a part of their practice. It was a project of stupendous magnitude and was correspondingly shackled by conflicting intentions, indecision, incapability, and vaulting ambition. In the work as it stands — its culmination was announced to the world in 1647 — we have perhaps the most remarkable example of the conglomerate result of the work of many great men that the Renaissance has to show. In that measure, at least, it is a splendid masterpiece and as such cannot be passed over because of the alleged incompatibility of abstract beauty and inconsistent internal anatomy, or because of "lack of organic unity," or dismissed with the words "out of scale." It may be safely regarded as great enough to have its own scale, which it should be the part of our humble ineptitude to study for what there is in it.

*With the exception that a sixth chain was inserted in 1748 between the second and fourth mentioned above.



Dome of St. Peter's, Rome. At left half section of lantern and oculus, showing position of shells at crown of dome.
At right, half elevation of lantern and crown of dome. (*From Letarouilly and Simil.*)

(*The next paper in this series will appear in the November issue and consider St. Paul's, London.*)

Bibliographic Note. It should be borne in mind that within the brief compass of these pages it is not possible or feasible to consider various controversies as to structural methods or attribution of designs, which invariably arise in regard to so important a building, or even in connection with its major mass, the dome. For the benefit of those who desire to consider the subject in detail the following suggested list of works is appended: Anderson, Architecture of the Renaissance in Italy, New York, 1901; Durm, Die Baukunst der Renaissance in Italien, Leipzig, 1914 (*in* Handbuch der Architektur); Durm, Zwei Grossconstructionen der Renaissance in Italien (*in* Zeitschrift für Bauwesen, 1887); Fontana, Il tempio vaticano e sua origine, Rome, 1694; Geymüller, Die ursprüngliche Entwür fe für Sanct Peter in Rom, Wien and Paris, 1875–80; Gosset, Les Coupoles d'Orient et d'Occident, Paris, 1889; Gotti, Vita di Michelangelo, Firenze, 1876; Isabelle, Les Édifices circulaires et les Domes, Paris, 1855; Jovanovits, Forschungen über den Bau der Peterskirche, Wien, 1877; Letarouilly & Simil, Le Vatican et la Basilique de Saint Pierre de Rome, Paris, 1882; Moore, Character of Renaissance Architecture, New York, 1905; Poleni, Memorie istoriche della gran cupola del tempio Vaticano, Padua, 1748; Simpson, History of Architectural Development, vol. 3, New York, 1911; Symonds, Life of Michelangelo, London, 1899; Vasari, Le vite de più eccellenti pittori, scultori e architetti, many editions.

Main Entrance to Pennsylvania Railway Station, New York City. McKim, Mead & White, Architects

"From Twenty-Third Street Up."

THE ARCHITECTURAL DEVELOPMENT OF FIFTH AVENUE AND INTERSECTING STREETS IN NEW YORK CITY.

By AYMAR EMBURY II.

THERE has probably never been in the course of the history of any city a more interesting and radical development and change than that which has taken place from 23d street up, in New York, during the past ten years. It is possible that the monumental improvements effected in Paris by Baron Hausmann are, in their cost and in their far-reaching effect upon the character of localities, comparable to the change which has taken place in New York; but the causes and purposes of the two changes were in all respects different, and the results are very unlike. There has been in New York no re-location of streets, no opening of new streets, and little essential change in the transportation problem to account for the enormous transformation which has taken place in the two miles from 23d street to Central Park; nor has there been any extraordinary increase in the number of businesses, or in the nature of the businesses which the city is housing. The reasons for the change are therefore obscure and difficult to isolate, so that they may be recognized as reasons.

Let us, in the first place, review briefly the progress of construction and the character of the businesses which are housed in new buildings in New York at this time and in the district which we are considering. Fifteen years ago, perhaps even ten years ago, the manufacturing districts of New York's largest industry, the making of ready-made clothing for men and women, were scattered about the lower East Side, the warehouses for dry goods of all descriptions were in the side streets opening off Broadway immediately north of the City Hall, and there were solid blocks of buildings in Wooster street, Leonard street, Murray street, and Worth street devoted to the storage and wholesale distribution of woolen goods, knit goods, silks, and the like. The great retail shopping district was to the south of the center of 23d street, curiously enough the south side of 23d street being alone utilized by the department stores, and the few blocks between 14th and 23d streets and Broadway and Sixth avenue included all the great department stores,—Arnold Constable, Lord & Taylor, and Aitken on Broadway, in the neighborhood of 18th street; Macy's, Siegel-Cooper, O'Neill-Adams & Company, and Altman & Company on Sixth avenue, below 23d street; and Stern Brothers, Le Boutillier, and other smaller stores on the south side of 23d street itself. Every one of these stores has since changed its location, with the single exception of the Siegel-Cooper Company. The other store buildings are either idle or are partially filled with manufacturing industries.

The theaters at that time were practically all below 34th street, and the one new element of business, the smart, small shop, had not yet developed into its present prominence.

The first part of the district above 23d street, in which a definite change occurred, was in the neighborhood of Fourth avenue. The dry goods trade moved practically *en masse* from lower Broadway to Fourth avenue, between

20th and 34th streets, and to the side streets immediately adjacent to Fourth avenue, partially invading Madison square and Madison avenue, once one of the pleasantest residence streets of New York. The buildings in which the woolen trade was housed under former conditions were old four or five-story stone buildings, usually built on lots of 25 feet frontage, and where a business expanded, openings were cut from one building to another to take care of the increase. In the new district practically no buildings were built with less than 40 feet frontage, and probably the great majority of all the buildings run from 40 to 60 feet in width and from 10 to 14 stories in height. The expansion in business is now provided for by increase in the space occupied vertically instead of horizontally. Many of these new buildings are of considerable architectural interest, and since their designers have had time to see the results of the first experiments, the office and loft buildings of steel construction have settled down more or less into two separate types so far as façade treatment is concerned: one type derived from Classic architecture, and the other from Gothic work, in which the vertical motives have been utilized to encase the columns, with a pseudo-Gothic treatment of detail. The number of good buildings of both types is quite amazing, and the few which have been selected to illustrate this article, while sufficiently typical of them all, were not chosen because they were the best, but because they were both good and typical.

Irving Press Building, East 31st Street

The building at 103 Madison avenue and the Burton Building at Fifth avenue and 29th street are both designed with classic motives and are buildings for the dry goods trade, the Burton Building housing a single business and its employees, while the building at 103 Madison avenue is let out in separate floors. The Crompton Building at 31 East 31st street is, on the other hand, treated with some reminiscence of Gothic detail; but solid block fronts on Lexington, Fourth, and Madison avenues, as well as on the side streets between them, repeat variations of these motives in a greater or lesser degree of excellence.

Occasionally residences have been remodeled into business buildings for those people who prefer to have some individuality about the space which they occupy, and here and there we find one of them, temporarily at least, surviving the invasion of loft buildings in a way which leads us to hope that more of the old construction may be similarly managed. The Irving Press Building, in East 31st street, is an excellent example of such treatment of an old residence, but it is one of the few surviving, and even the lovely building for the Colony Club

Crompton Building, East 31st St.
Wallis & Goodwillie, Architects

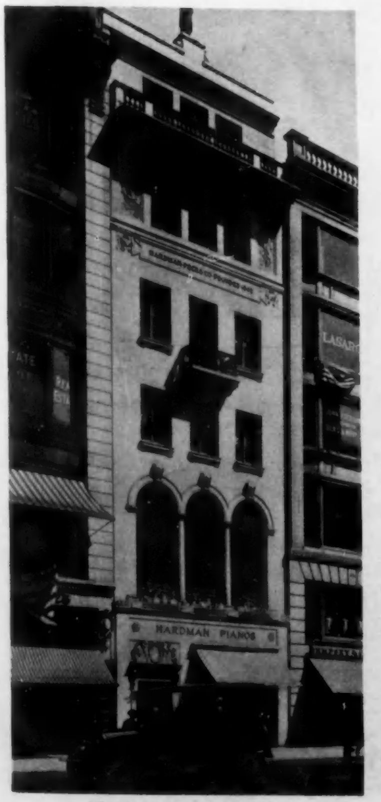
Burton Building, 267 Fifth Avenue
Starrett & Van Vleck, Architects

Apartment House, Lexington Ave.
P. C. Hunter, Architect

now lies vacant and desolate, awaiting the time when it may be removed to give place to a stark, uncompromising business structure.

The second phase of the development in the district, and one which has been without any real reason, so far as can be seen, is the development of the loft building for manufacturing purposes in the square enclosed by Fifth and Seventh avenues and 23d and 36th streets. The manufacture of clothing was for many years confined to the districts bordering the lower East Side, where the conditions existing were perhaps neither sanitary nor proper for the work people, but the location was accessible to their homes, as well as on cheap land in a district not already occupied by other industries. Just why the manufacturing loft buildings should have sprung up in such numbers in the district they now occupy is incomprehensible ; land was not particularly cheap, transportation facilities to the lower East Side are very poor, and the district was already occupied by retail businesses of fairly high class. Now these streets from Fifth to Seventh avenues are pretty solidly built up with ten and twelve-story loft buildings, which at noon and at night pour many thousands of workers into the surrounding streets. These people have little purchasing power for the shops which they necessarily pass, the crowd is so dense and at times so unpleasant as to destroy the custom of these shops, which therefore have been compelled to move, and being compelled naturally gravitated to districts "on the avenue," beginning shortly above 23d street and continuing by degrees to 59th street. About the first of .he big specialized shops to move were the jewelry houses of Tiffany & Company and The Gorham Company, whose present familiar buildings face each other diagonally across Fifth avenue at 36th street. Following them came a host of smaller shops, for many of which extremely attractive small buildings were built, such buildings as those occupied by Costikyan & Company and Schanz at 12 and 14 East 40th street, respectively ; by Huber & Company at 13 East 40th street ; a little building at 13 West 38th street ; Hardman-Peck's Building at 433 Fifth avenue ; the Jaeckel Building, 384 Fifth avenue ; the Edison Building, 473 Fifth avenue, and many others

Loft Building, 103 Madison Avenue
Sommerfeld & Steckler, Architects



Hardman-Peck Building
433 Fifth Avenue
Harry Allen Jacobs, Architect

Architects' Building, 101 Park Avenue
Ewing & Chappell and La Farge & Morris
Associated Architects

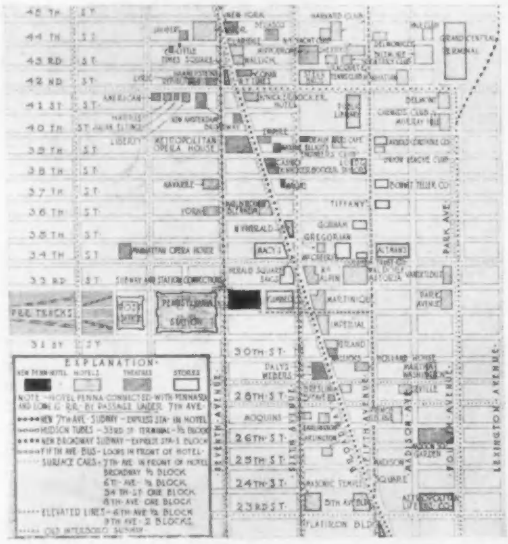
H. F. Huber Building
13 East 40th Street
J. H. Freedlander, Architect

of equal architectural merit and of equal importance as retail houses.

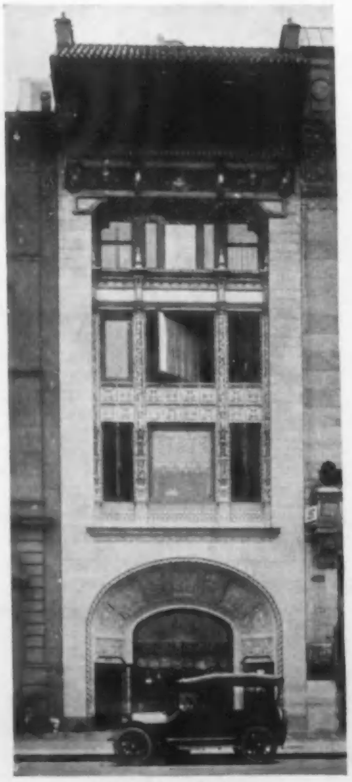
Besides these, certain other shops which had small beginnings have gradually grown into large businesses, so that Fifth avenue between 23d and 59th streets is now, perhaps, the most interesting and the most gorgeous shopping district in the world. The tendency has been to treat these buildings with a constantly diminishing area of show window, and to beautify these show windows as much as possible, so that the windows along Fifth avenue are in many cases color compositions of as great merit as very many pictures. Lord & Taylor's, indeed, has not hesitated to make the background of their show windows of very delightful mural decorations by Arthur Covey — an experiment which is thus far unique, but certainly worth imitation. The shopkeepers, in general, seem to realize that it is almost impossible to show enough of their goods in their windows to explain very fully the purposes of their shops, and they have endeavored to impress the buying public of the character of their shops by the architecture and general artistic handling of the building, using that as an index or expression of purpose of the goods within. This has definitely caused builders of the new shop buildings to seek out good architects and good designs, so that the shop architects of New York have received an impetus apparent nowhere else in the world, and which is bound to carry shop design very far.

Before the steady influx of business into the district from 23d to 42d streets, the other activities have necessarily retired; lower Fifth avenue used to be a considerable club district; to-day it has none but the Union League Club left, although West 40th street facing on Bryant Park has afforded a place of refuge, perhaps only temporarily, for a number of these organizations including the Engineers' Club, the Republican Club, and the New York Club. Opposite the Union League Club remains a handsome old red brick and brown stone house, 442 Fifth avenue, which is one of the few

Old Residence, 442 Fifth Avenue



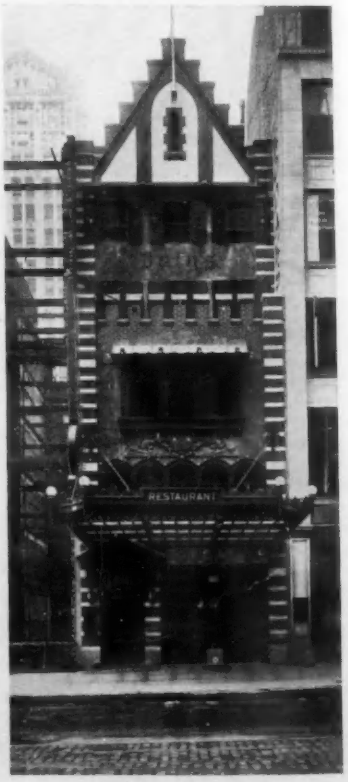
Map of New York, "From Twenty-Third Street Up"



The Edison Building
413 Fifth Avenue
Shape & Brady, Architects

Jaeckel Building
384 Fifth Avenue
McKim, Mead & White, Architects

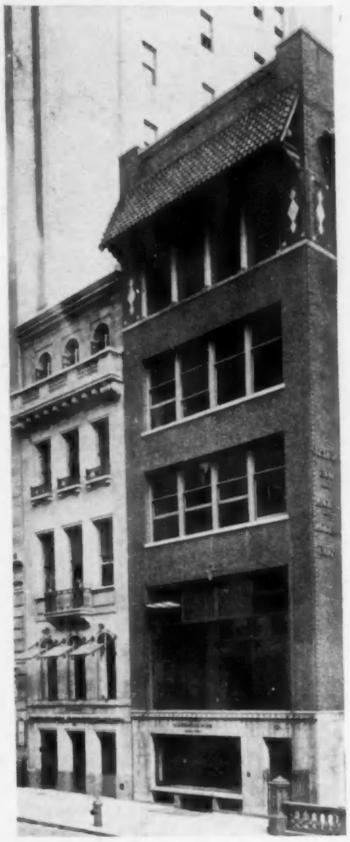
Loft Building
13 West 38th Street
E. W. Nast, Architect



Daly's Restaurant
20 East 42d Street
John Ph. Voelker, Architect

surviving residences in the lower district. This building has a rather interesting little story connected with it: it was the home of one of the wealthiest men in New York, a man who controlled an enormous amount of property and whose office door bore the sign, "No real estate for sale." For very many years he had lived at the corner of 39th street and Fifth avenue with a vacant lot on either side, and it is said that he refused enormous sums for these pieces of property because he wanted a place for his dog to run. Aside from the story, the house is in itself interesting to the architect because it is a survivor of the brown stone era, which we are all accustomed to condemn wholesale and without much thought on the subject. There were, as a matter of fact, a very large number of houses of excellent design built in New York in this brown stone era, which was after all a period when the Italian was the source from which most of the architects drew their inspiration, just as to-day in their city work they are looking to the Italian precedent, and it is very doubtful if much of the Italianesque work of the present time is better in proportion, in handling of detail, or in choice of material than were the old brown stone, or brown stone and red brick houses, of which 442 Fifth avenue is but a single example.

The residence district, too, has largely moved north of 42d street; in fact, south of 59th street there are but few new residences (whether single houses or apartment houses) being built and in the lower district from 23d to 42d streets, there is but one large new apartment house with which the writer is familiar — that at Lexington avenue and 38th street. While the restrictions still preserve certain parts of Murray Hill in their original residential character, numerous incursions into this territory have been made by the invading army of business, and unless the re-districting scheme for the city goes through, Park and Madison avenues and their side streets will be lost to us in their traditionary form as strongholds of affluence. It is in this district that the excellent Yale & Towne Building and the Johns-Manville Building have been built; the Architects' Building is on the fringe of the district, as well as other commercial buildings, both tall and low.



Schanz Building at Left, Buchman & Fox, Architects; Costikyan Building at Right, Mann & MacNeille, Architects

Nor could the lighter side of New York's life stand the pressure of business any more than the residential. The old Tenderloin and the old theater district have moved, and it must be a favorable enthusiast on the preservation of things as they were who would not have been glad to see them go. Wallack's Theater has been torn down; Daly's Theater, Weber's Theater, and Proctor's old Fifth Avenue Theater are movie houses; the old Lyceum has been gone for ten years, and the Madison Square Theater, too. While a few new theaters have been built in the neighborhood of 42d street, notably the 39th Street Theater and Maxine Elliott's Theater, the latter, by the way, a very lovely example of theater architecture, for the most part the theatrical business now centers to the north, and the hotels have moved with the theaters, with the exception of the Waldorf-Astoria, which seems to be impregnably entrenched in its present location, and which, once the smartest and gayest of all our hotels, is now looked upon as a staid, old-fashioned sort of place, where the food and service are as good as ever, even if the decoration is no longer bright. Fortunately with the theaters and hotels have gone the dirty nest of dives which used to make Sixth avenue and 28th street hideous; and while we cannot assume that vice in New York has been lessened in amount, at least it is freshly gilded and wears a more decent expression upon its face.

Lord & Taylor Building, Fifth Avenue
Starrett & Van Vleck, Architects

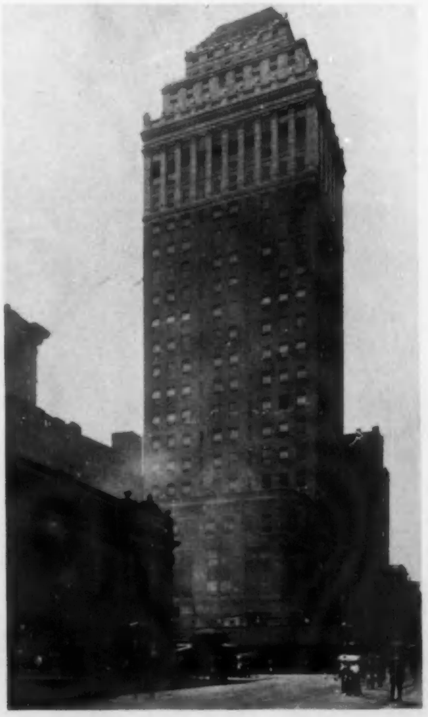
Another great factor which has just begun to influence the character of the city is the location of the Pennsylvania Station at Seventh avenue and 33d street and the approaching opening of the

Hotel Pennsylvania, Seventh Avenue
McKim, Mead & White, Architects

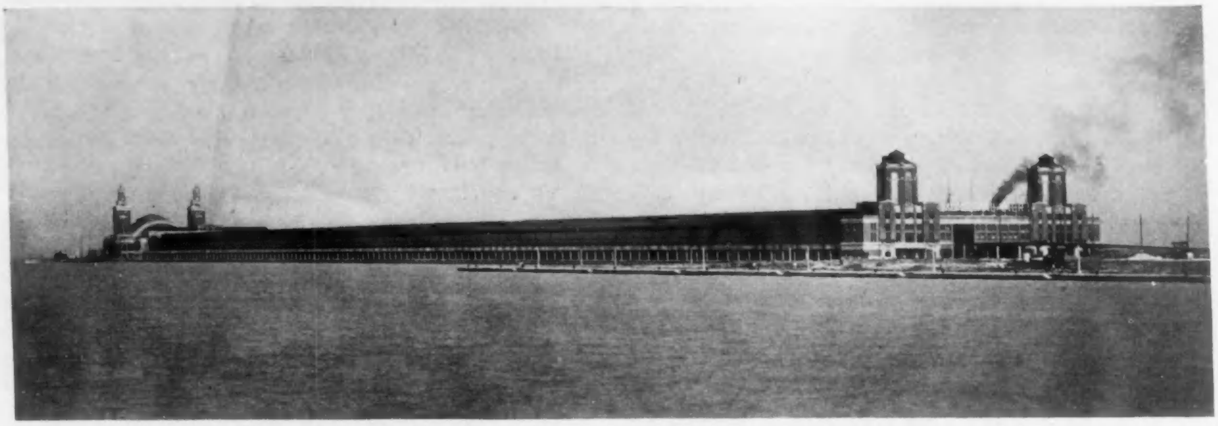
Printing Crafts Building, Eighth Avenue
E. L. Larkin, Architect

new subway line along Seventh avenue. The erection of the Pennsylvania Railroad Station was expected to be followed by an era of reconstruction in that part of the city, and two department stores, coming from other cities, — Gimbel's and Saks', as well as Macy's, — secured locations where they expected the traffic to be most heavy; but aside from these buildings about the first fruits of regeneration in that former negro quarter have been the excellent Press Crafts Building at the corner of 34th street and Eighth avenue, and the new hotel, now just begun, fronting the Pennsylvania Station on Seventh avenue. It would seem, however, as if the district between Seventh avenue and Fifth avenue, thus bounded by currents of travel of high quality, would eventually become New York's most important business district unless some movement as irrational and unforeseen as that which has caused the building up of this district causes its decline. It is to prevent such a movement that the re-districting scheme above mentioned has been proposed, and the city, as a whole, is earnestly hoping for its adoption. This scheme roughly proposes that the whole city be divided into zones or districts which may be restricted for residence purposes, or for business purposes, or for manufacturing purposes; and while it is proposed that residences and offices may continue in business districts, it is intended to permit no manufacturing in business districts, and no business or manufacturing in residence districts. This would stabilize real estate values to an extent which has been hitherto unknown, so that while the opportunity to amass great fortunes through acquiring property to be held until the city grows up to it will be much lessened, at the same time there will be no such loss as that which occurred on 23d street and on lower Broadway, where enormous sections of property, once both valuable and remunerative, now lie idle and a burden to their owners. The law will not disturb existing conditions, but the movement fostered by retail merchants and known as "Saving New York" has already secured one benefit — the removal of small manufacturers from the streets adjacent to upper Fifth avenue.

Office Building, 8 West 40th Street
Starrett & Van Vleck, Architects



New Law Office Building, 42d Street
Jardine, Hill & Murdock, Architects

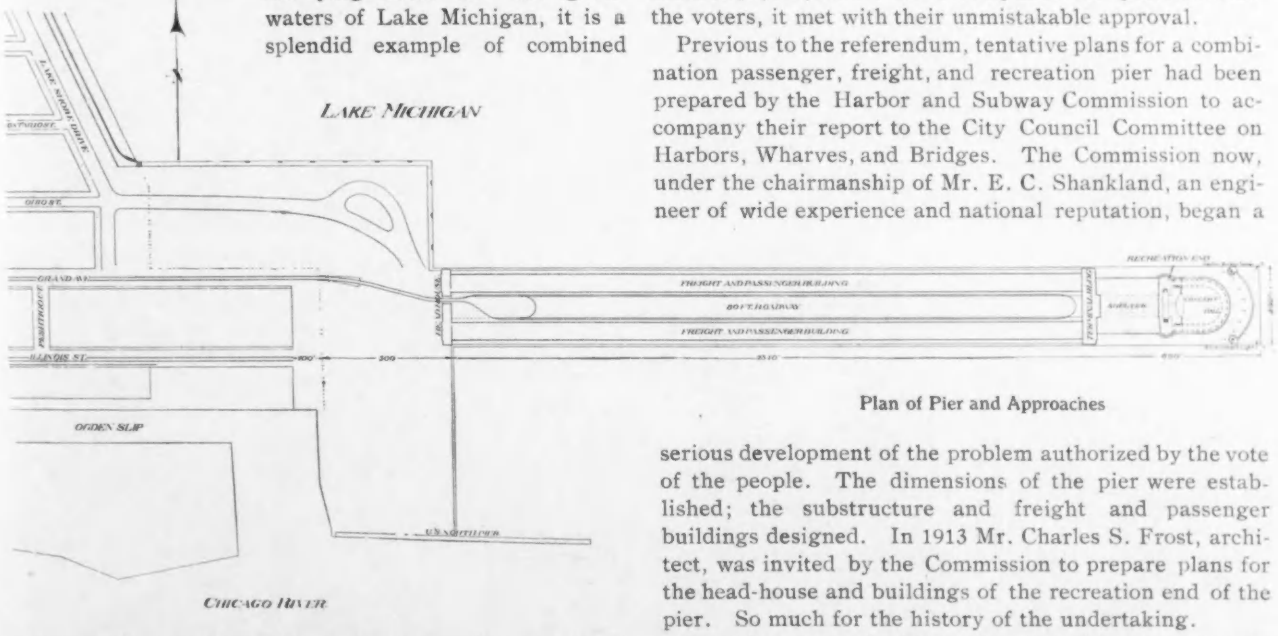


The Chicago Municipal Pier.

CHARLES S. FROST, ARCHITECT.

By IRA W. HOOVER.

AT the foot of Grand avenue and terminating the recent extension of Lake Shore Drive is located the new Municipal Pier, Chicago's latest contribution to the social and economic welfare of its citizens. As seen from the Drive, extending out in a low-lying mass into the green waters of Lake Michigan, it is a splendid example of combined civic utility and popular recreation. Its purpose is primarily utilitarian, and federal authority for its construction, as the initial development of "Outer Harbor District No. 1," was obtained on that basis; the recreational features being, so far as the government was concerned, entirely unofficial.



Plan of Pier and Approaches

The port of Chicago, handling over 2,000,000 passengers annually, has been for years lamentably behind the times in its dockage facilities for passenger and package freight carrying boats, and the pier was designed to overcome the necessity for large steamers of these classes entering the narrow Chicago River, thus avoiding bridge delays to vessel interests, street vehicles, and pedestrians alike. The promised relief from these conditions was a strong factor in creating public sentiment in favor of an outer harbor, and when, in the spring of 1912, a bond issue of $5,000,000 for its development was placed before the voters, it met with their unmistakable approval.

Previous to the referendum, tentative plans for a combination passenger, freight, and recreation pier had been prepared by the Harbor and Subway Commission to accompany their report to the City Council Committee on Harbors, Wharves, and Bridges. The Commission now, under the chairmanship of Mr. E. C. Shankland, an engineer of wide experience and national reputation, began a serious development of the problem authorized by the vote of the people. The dimensions of the pier were established; the substructure and freight and passenger buildings designed. In 1913 Mr. Charles S. Frost, architect, was invited by the Commission to prepare plans for the head-house and buildings of the recreation end of the pier. So much for the history of the undertaking.

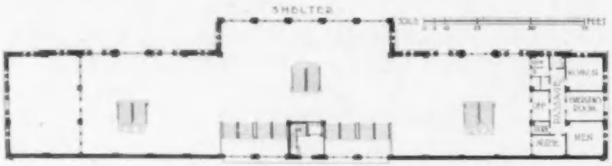
By reference to the block plan it will be seen that the pier consists of three distinct sections: the head-house, the freight and passenger building, and the recreation group, the latter including the terminal building, shelter, and concert hall.

The head-house contains the offices of the harbor master and pier officials; also utility rooms for electrical control, heating, etc. Pedestrians gain access to the pier through the head-house, ascending by broad and easy ramps to the passenger deck of the freight and passenger building, and by stairs to the board-walks above. The

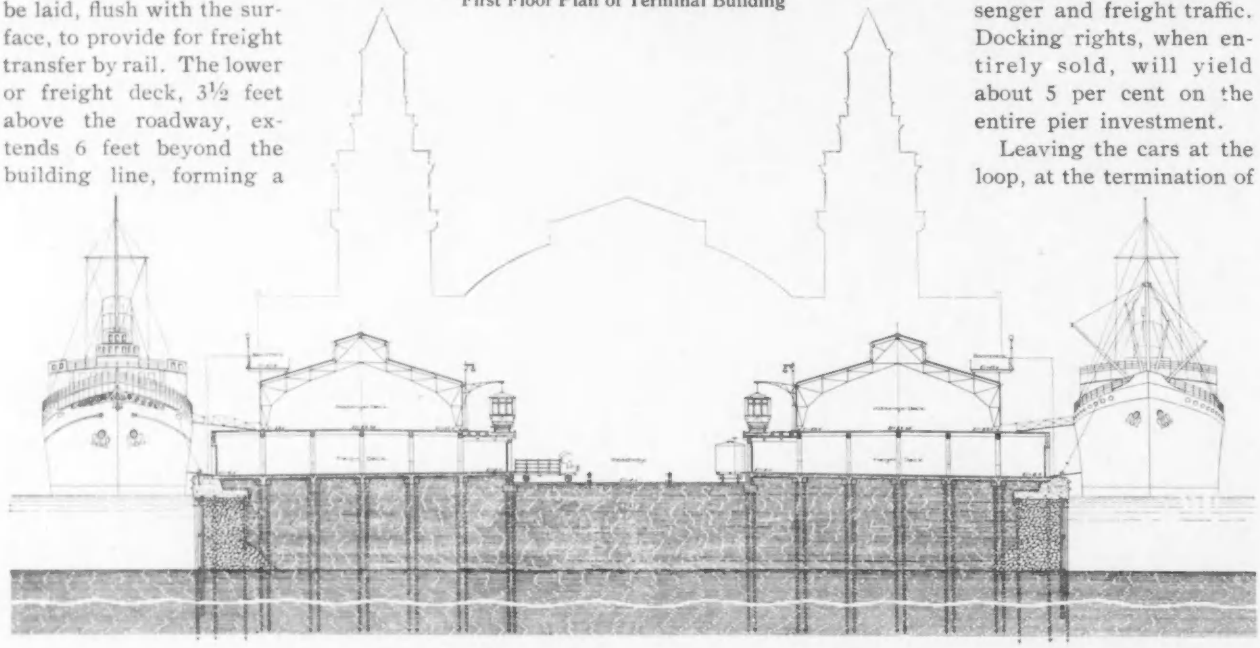
towers contain gravity tanks of 60,000 gallons capacity each, supplying the sprinkler system protecting the entire freight section.

The pier extends into the lake, beyond the head-house, a distance of 3,000 feet, having a width of 292 feet. The freight and passenger building, occupying the bulk of the structure, consists of two sections, each 2,340 feet long by 100 feet wide. A roadway, 80 feet in width, divides these sections, being used for trucking and motor access to the recreation end of the pier. As freight traffic develops, tracks will be laid, flush with the surface, to provide for freight transfer by rail. The lower or freight deck, $3\frac{1}{2}$ feet above the roadway, extends 6 feet beyond the building line, forming a freight wharf having a total length of nearly 5,000 feet. The upper deck is for the exclusive use of boat passengers and pier visitors, who reach it either by the ramps before mentioned or by trolley. Cars enter the pier at this level, run to the extreme end of the freight and passenger building where they loop to the opposite side, giving equal service to both sections. Passengers are discharged at their particular steamer, which they conveniently board at the upper deck. This portion of the pier is available only to steamship lines having a combined passenger and freight traffic. Docking rights, when entirely sold, will yield about 5 per cent on the entire pier investment.

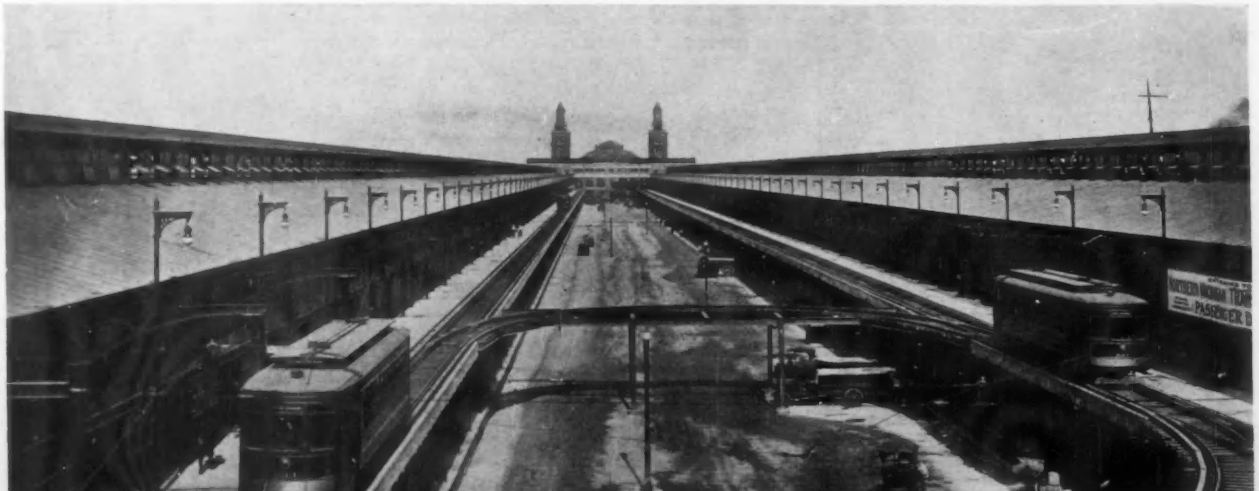
Leaving the cars at the loop, at the termination of



First Floor Plan of Terminal Building



Cross Section Through Freight and Passenger Portion of Pier



View from Head-House Looking Down Roadway to Terminal Building

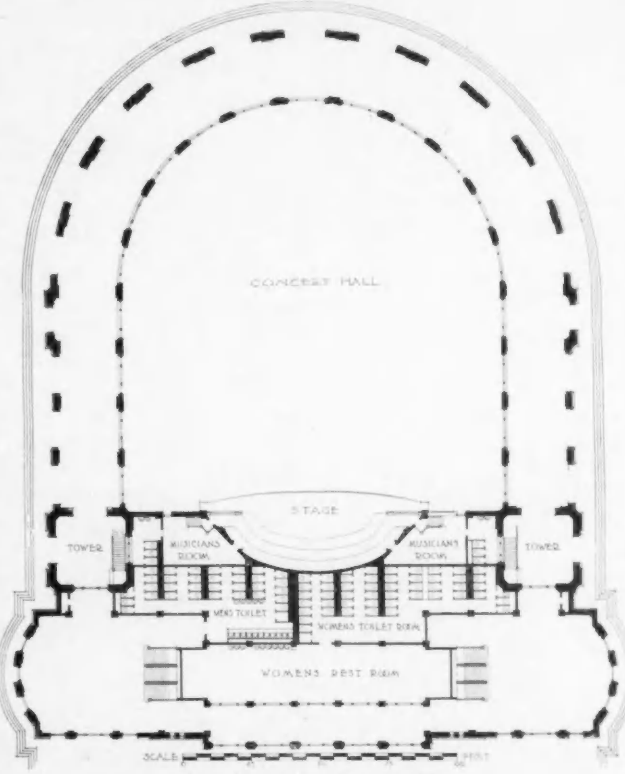
the freight and passenger building, we enter the terminal building, the first unit of the recreation group. This section is used for general circulation, broad stairways giving easy access to the various levels. Here are located information bureaus, toilet rooms, a well appointed emergency hospital, and on the third floor a restaurant, 30 feet by 245 feet, overlooking the water on three sides and adjoining uncovered decks, making possible unlimited *al fresco* service.

The terminal building and concert hall are connected by the shelter building, 80 feet by 220 feet. In this section an effort was made to eliminate, as far as possible, all obstruction to a free circulation of air, and at the same time provide protection from sun and sudden showers. As anticipated, it has proved most popular, and it is a sultry day indeed when its cool shadows are not made more inviting by a gentle breeze.

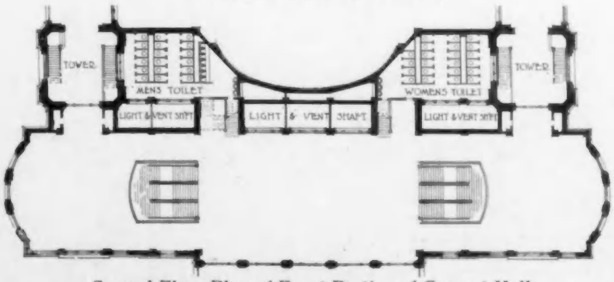
The superstructure of the pier is terminated by the concert hall, in connection with which a section has been arranged for the comfort of the public. One floor is used as a rest room — if such a thing can be said to exist in this place outside the hospital! Another floor is occupied by a women's retiring room, musicians' rooms, extensive toilets, etc. The concert hall proper has a length of 150 feet, a clear transverse span of 138 feet, and a height of 100 feet, including the monitor. It has a seating capacity of 4,000 which is greatly increased by the open loggias encircling the hall at three levels. Flanking the concert hall are the observation towers, 165 feet in height. Balconies and open platforms at various levels give unobstructed views of the city's far-reaching shore line and, on clear days, the sand dunes of Indiana, to the eastward, 40 miles across the lake.

The promenade surrounding the recreation group descends in broad terraces, reaching at the extreme end of the pier the landing for small boats at a level but 4 feet above the water, the elevation of the pier proper being 9½ feet. All excursion steamers, boats for the north and south parks — in fact, all strictly passenger craft, both public and private, arrive and depart only from the recreation end of the pier.

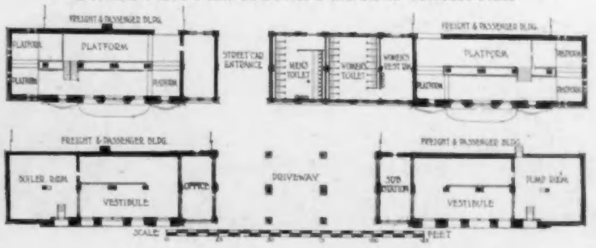
View of Passenger Deck



First Floor Plan of Concert Hall



Second Floor Plan of Front Portion of Concert Hall



Detail of Flagstaff

First and Second Floor Plans of Head-House

Detail of Pylon

In considering the methods of construction and materials used, it must be remembered that this is a vast public utility and playground, free to all comers, the mere fact of being free carrying with it a certain lack of responsibility on the part of many of the visitors. All classes, nationalities, and ages are represented in the daily thousands who gather here for recreation and relief from superheated rooms and pavements. Methods and materials were adopted to eliminate as far as possible petty vandalism. The decks and floors throughout, with the exception of the concert hall, are of concrete. Red pavers, with considerable variety of shade, are used for all exposed brick work, including high wainscoting in the principal public rooms of the head-house and recreation group. The modeled ornament used on the exterior is a more or less realistic representation of various forms of aquatic life; while the interiors, with the possible exception of the concert hall and restaurant, are devoid of decorative embellishment. Much of the structural steel is exposed, while in all cases the floor construction is undisguised.

"Big, raw, generous, crude, unfinished, mostly in the rough, yet with a practical and kindly feeling about it for its size that makes you right at home, this new municipal pier is a sort of microcosm of Chicago, if a diminutive may properly be applied to anything so impressive by its mere bulk as is this tremendous institution. It is big in idea, and this conception has been transplanted into concrete, brick, and steel with a courage of which you can form no conception save by seeing with your own eyes."

As a recreational and educational center the possibilities of this gigantic municipal enterprise are almost unlimited. While there have been many criticizable delays in awarding various much needed concessions, the pier is gradually finding itself, and has, within a few short weeks, taken a firm hold on the fancy of the people, and awakened the civic sense of many thousands. Free orchestral, vocal, and band concerts, arranged by the Civic Music Association, have met with a most hearty response by the public, as evidenced by capacity attendance. Having in mind the very successfully operated municipal dance halls of the previous administration, the Commission assumed that the concert hall would at times be used for that purpose, and to this end the floor was specially constructed for dancing. In spite of public clamor, however, this form of diversion has not up to the present prevailed. Tentative plans for the season of 1917 are already under way and in addition to more and better concerts, illustrated lectures by the Health Department are proposed. It has even been suggested that undenominational church services be held on Sunday mornings.

This digression will perhaps be excused for the attention it may call to the potential possibilities of the pier as a physical, educational, and moral influence in the community.

Following is a condensed tabulation of costs, areas, cubes, etc.:

Contracts			Totals
Head-House			
Building	$121,757.00		
Electric	10,000.00		
Plumbing	8,500.00		
Steam Heating	4,060.00	$144,317.00	
Sub-structure		7,994.00	$152,311.00
Freight and Passenger Building			
Building	$1,090,292.00		
Electric	108,000.00		
Plumbing	57,962.00		
Sprinkler System	99,405.00	$1,355,659.00	
Sub-structure		$614,649.00	$1,970,308.00
Recreation Buildings			
Building	$539,556.00		
Electric	72,000.00		
Plumbing	29,900.00	$641,456.00	
Sub-structure		223,190.00	$864,646.00
Total cost of buildings			$2,987,265.00
To which should be added:			
Filling 20.7 acres of land for approach and park east of head-house, including docks			$297,690.00
Miscellaneous items, including steel trestle, track platform, etc.			63,802.00
			$3,348,757.00
Overhead expenses of Harbor and Subway Commission, being 4 per cent of total cost			133,950.28
			$3,482,707.28

In addition, $300,000.00 was paid for necessary land to provide for street extensions, and securing riparian rights. Furniture, such as chairs, benches, tables, etc., has cost about $32,000.00. It is estimated that $75,000.00 will be required for a future permanent pavement of the roadway.

Areas and Cubes	Square Feet	Cubic Feet
Head-house	10,400	585,578
Freight and Passenger Building (not including roadway)	468,000	
Terminal Building	15,415	773,964
Shelter	17,919	612,232
Concert Hall, etc.	45,616	2,626,213
Total area of buildings	505,900	
Area of pier, including head-house	886,400	
Percentage of pier covered by buildings	63	
Percentage of recreation end buildings	41	

View of Recreation End of Pier from Lake Michigan

GENERAL VIEW OF HEAD HOUSE AND FREIGHT AND PASSENGER BUILDING

VIEW OF CONCERT HALL FROM END OF PIER

MUNICIPAL PIER, CHICAGO, ILL.

CHARLES S. FROST, ARCHITECT

VIEW OF SHELTER AND CONCERT HALL FROM TERMINAL BUILDING

INTERIOR VIEW OF CONCERT HALL

MUNICIPAL PIER, CHICAGO, ILL.
CHARLES S. FROST, ARCHITECT

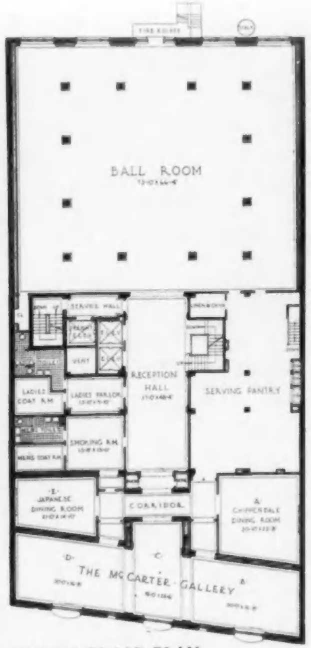
GENERAL VIEW OF PRINCIPAL FACADE

ROBERT TREAT HOTEL, NEWARK, N. J.
GUILBERT & BETELLE, ARCHITECTS

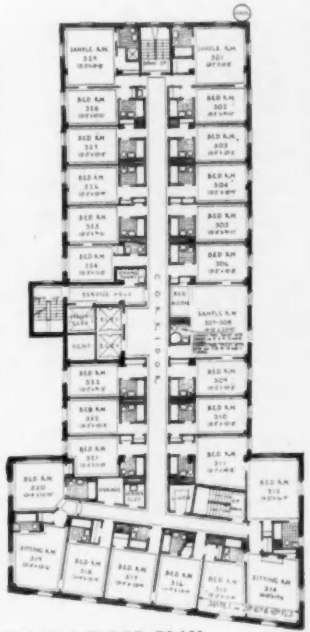
DETAIL OF LOWER STORIES

ROBERT TREAT HOTEL, NEWARK, N. J.

GUILBERT & BETELLE, ARCHITECTS

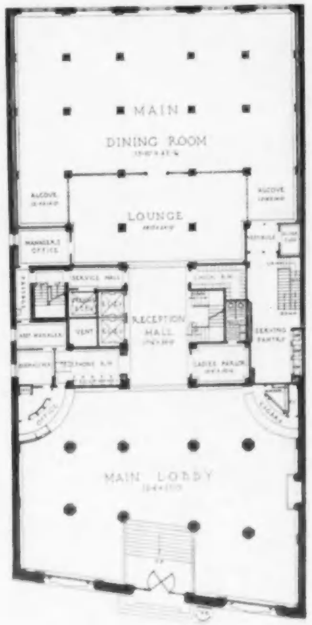


SECOND FLOOR PLAN



TYPICAL FLOOR PLAN

BASEMENT FLOOR PLAN



FIRST FLOOR PLAN

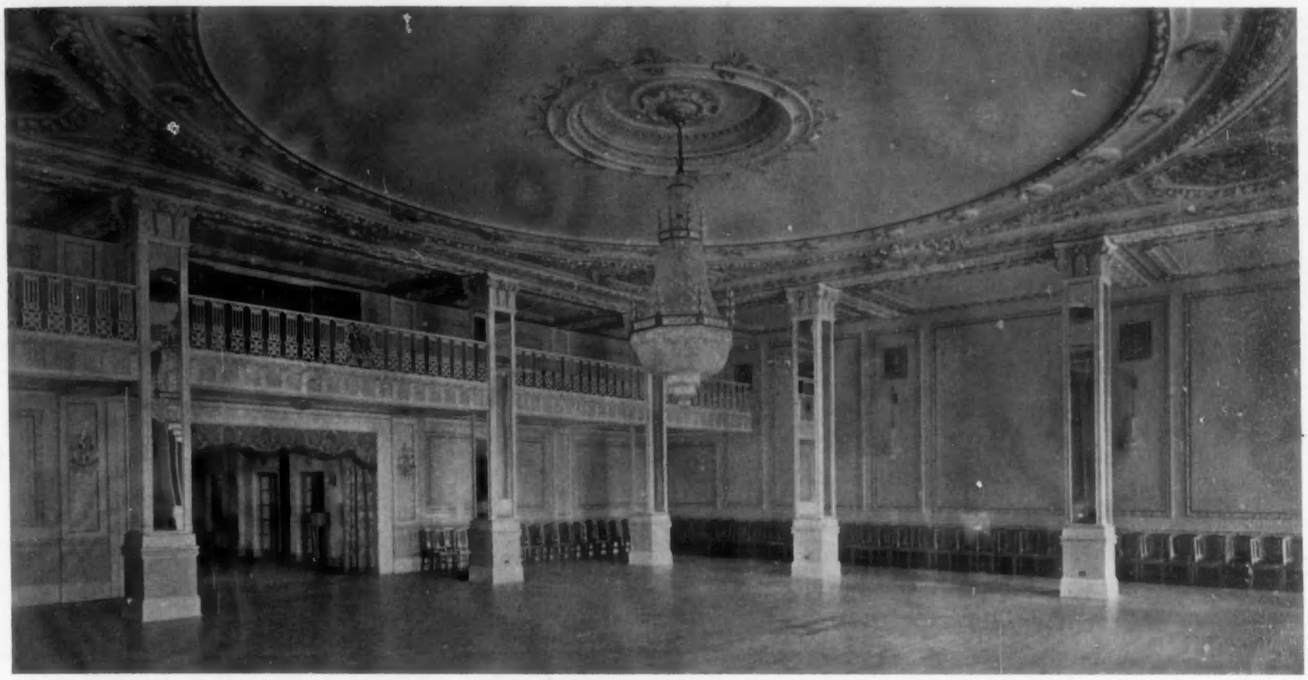
GENERAL VIEW OF LOBBY LOOKING TOWARD ELEVATOR HALL

GRILL ROOM

MEN'S CAFE

ROBERT TREAT HOTEL, NEWARK, N. J.

GUILBERT & BETELLE, ARCHITECTS



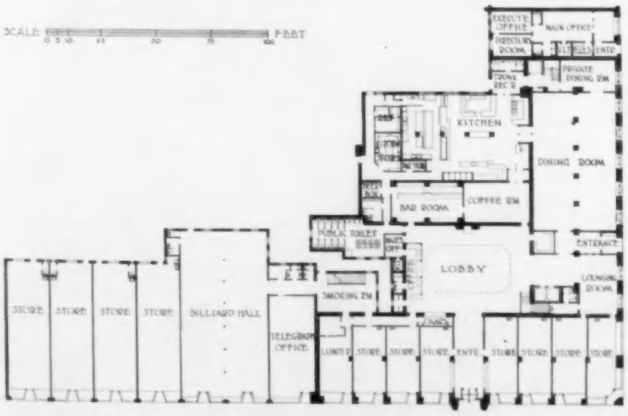
VIEW OF BALL ROOM

VIEW OF MAIN DINING ROOM

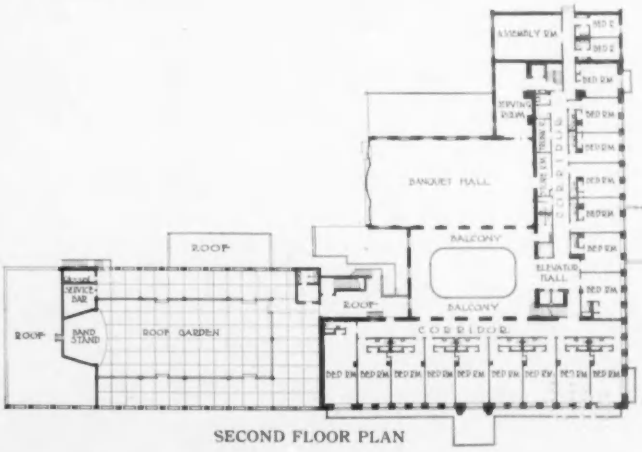
ROBERT TREAT HOTEL, NEWARK, N. J.

GUILBERT & BETELLE, ARCHITECTS

GENERAL VIEW OF EXTERIOR



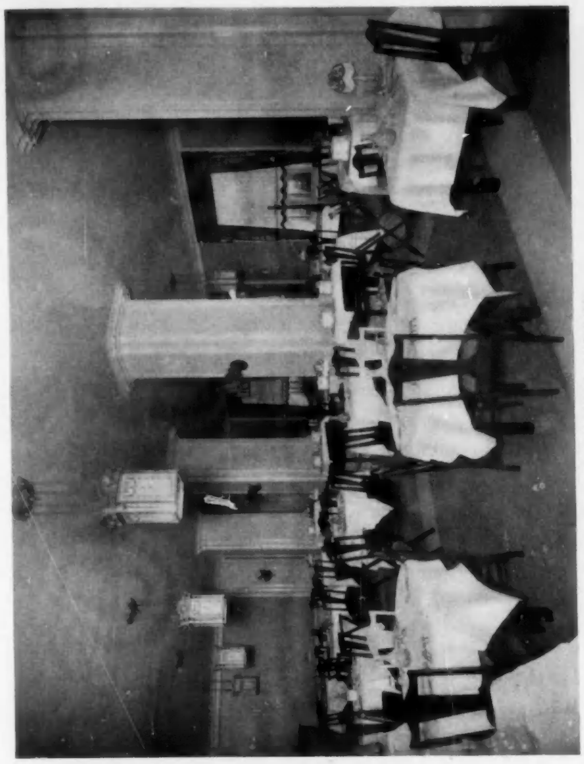
FIRST FLOOR PLAN



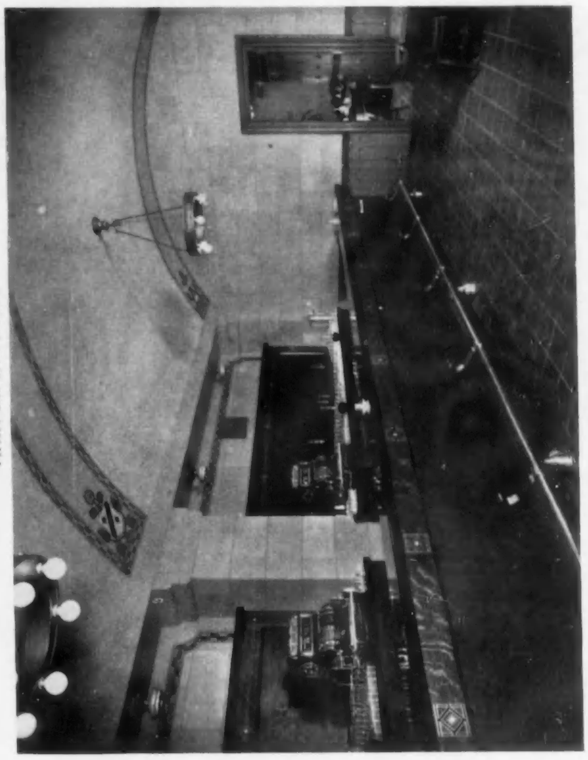
SECOND FLOOR PLAN

BANCROFT HOTEL, SAGINAW, MICH.

RICHARD E. SCHMIDT, GARDEN & MARTIN, ARCHITECTS



MAIN DINING ROOM

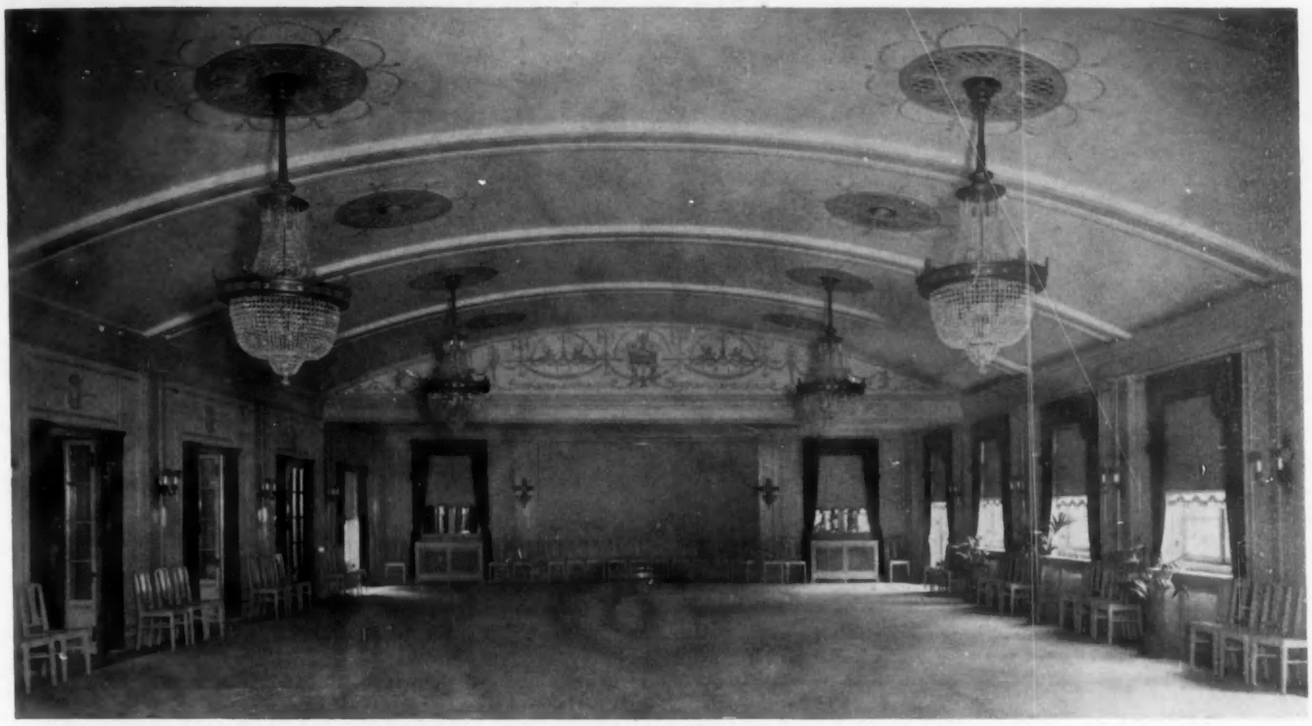


BAR ROOM

DETAIL OF MAIN ENTRANCE

BANCROFT HOTEL, SAGINAW, MICH.

RICHARD E. SCHMIDT, GARDEN & MARTIN, ARCHITECTS



BANQUET HALL

FIRST FLOOR LOBBY

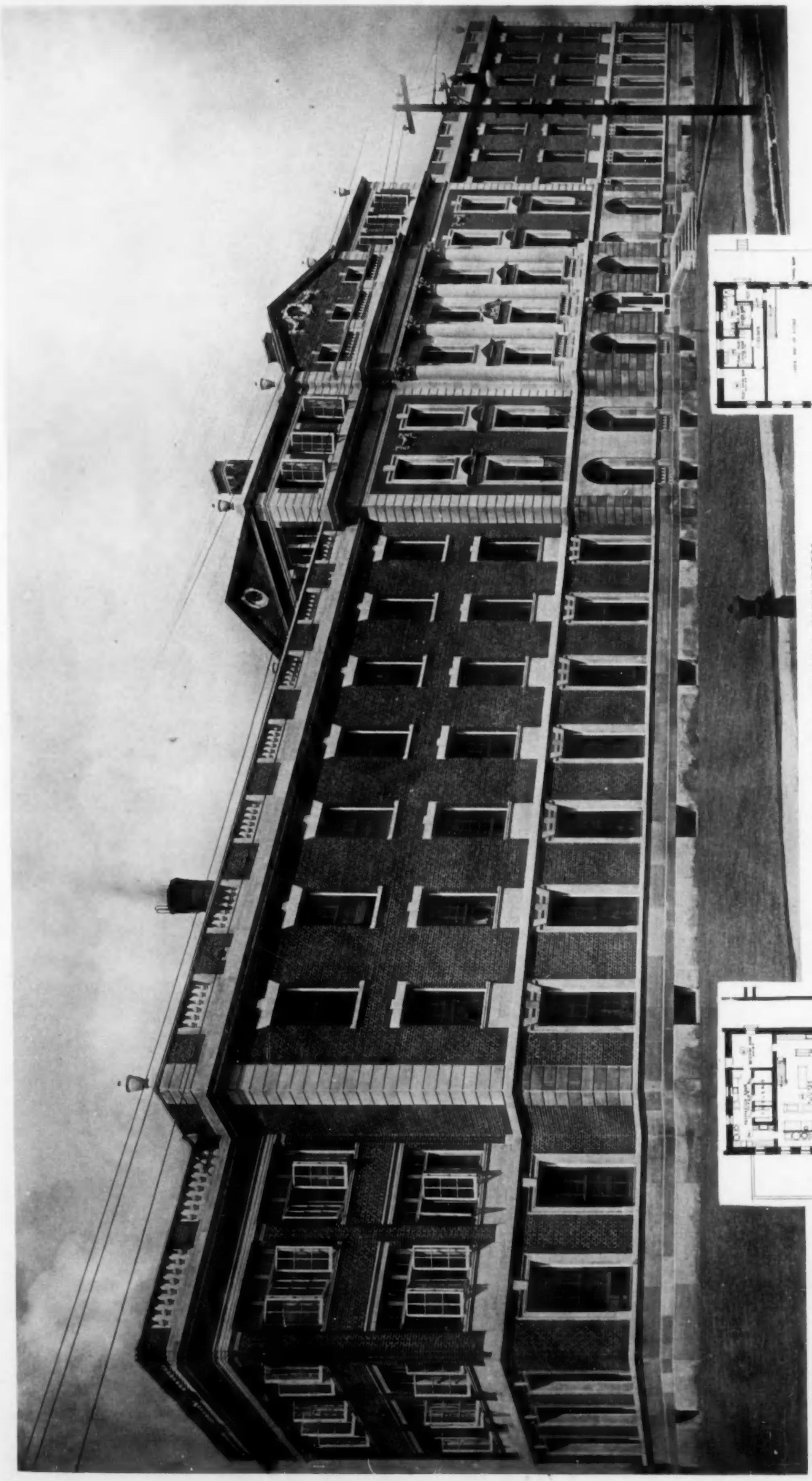
BANCROFT HOTEL, SAGINAW, MICH.

RICHARD E. SCHMIDT, GARDEN & MARTIN, ARCHITECTS

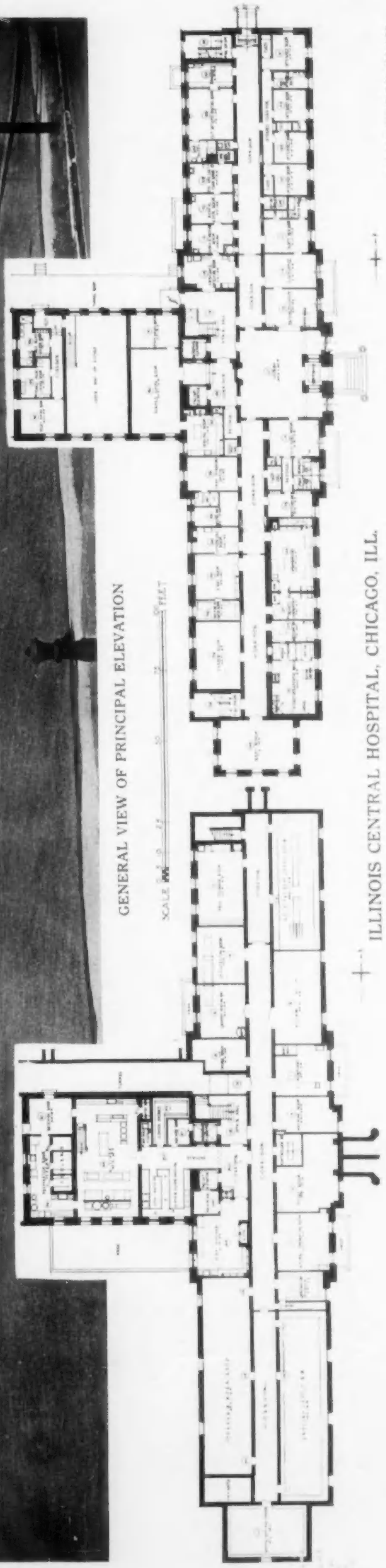
DETAIL OF ENTRANCE PAVILION

ILLINOIS CENTRAL HOSPITAL, CHICAGO, ILL.

RICHARD E. SCHMIDT, GARDEN & MARTIN, ARCHITECTS



GENERAL VIEW OF PRINCIPAL ELEVATION



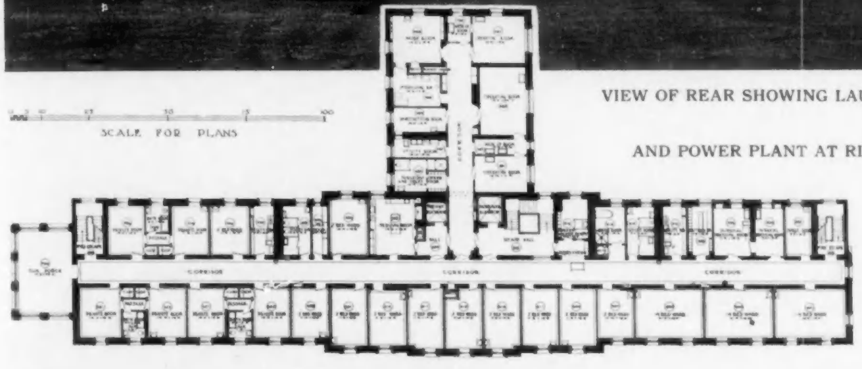
FIRST FLOOR PLAN

BASEMENT FLOOR PLAN

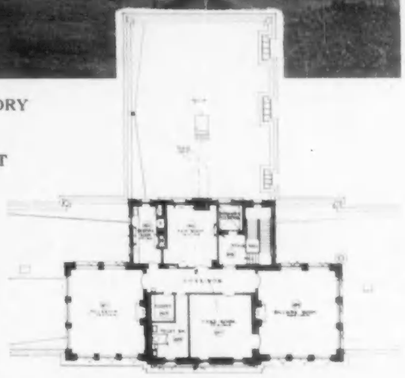
ILLINOIS CENTRAL HOSPITAL, CHICAGO, ILL.

RICHARD E. SCHMIDT, GARDEN & MARTIN, ARCHITECTS

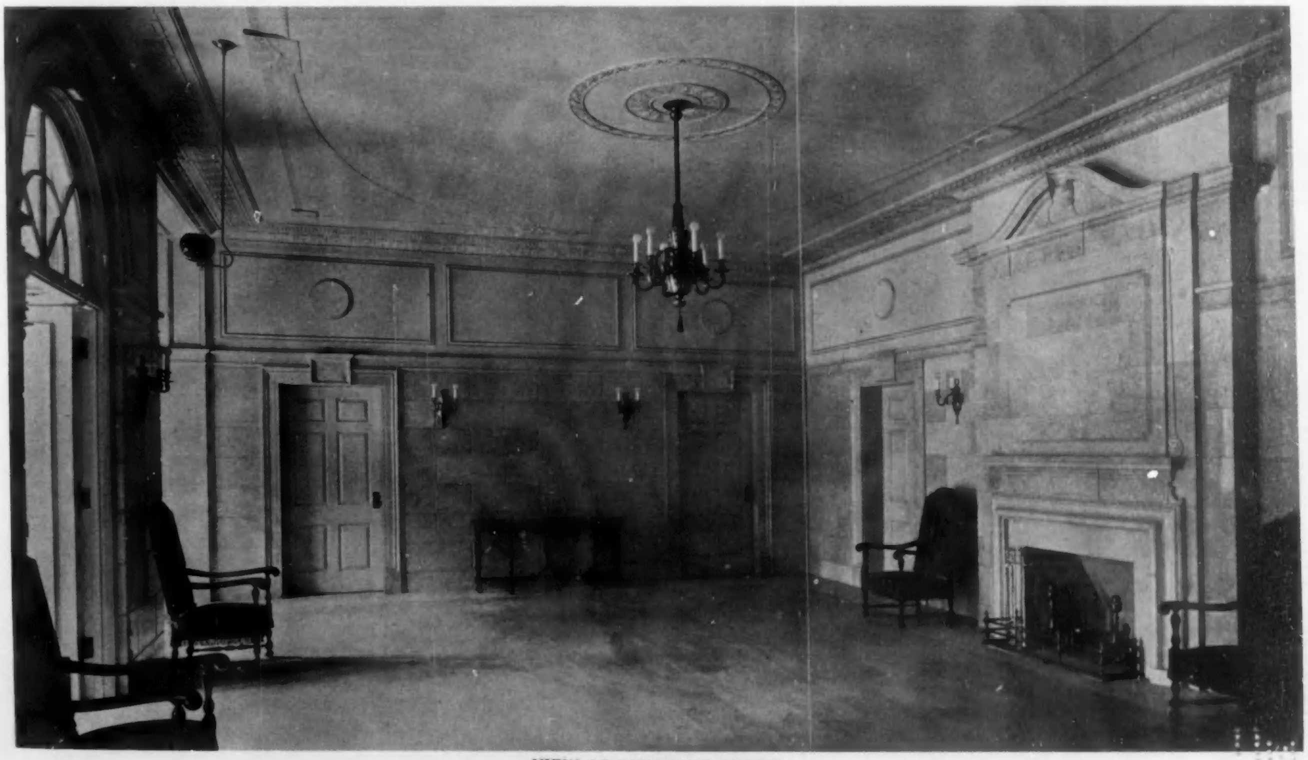
VIEW OF REAR SHOWING LAUNDRY AND POWER PLANT AT RIGHT



THIRD FLOOR PLAN



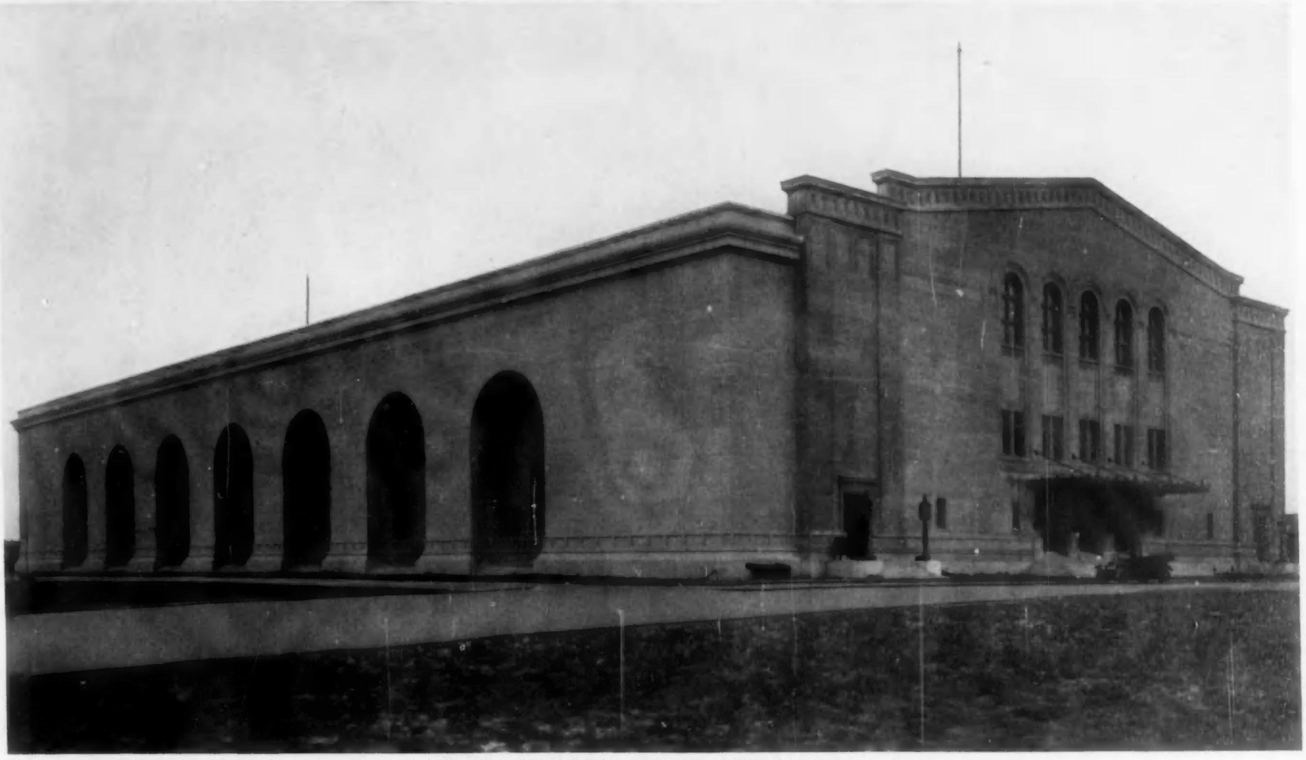
FOURTH FLOOR PLAN



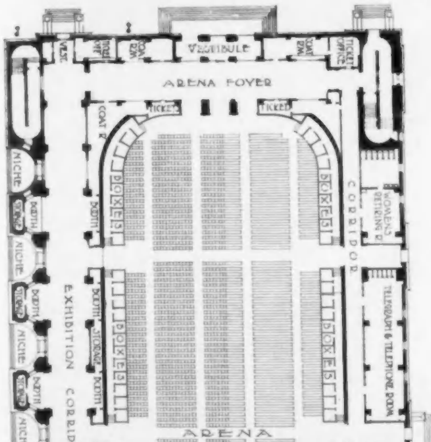
VIEW OF ENTRANCE LOBBY

ILLINOIS CENTRAL HOSPITAL, CHICAGO, ILL.

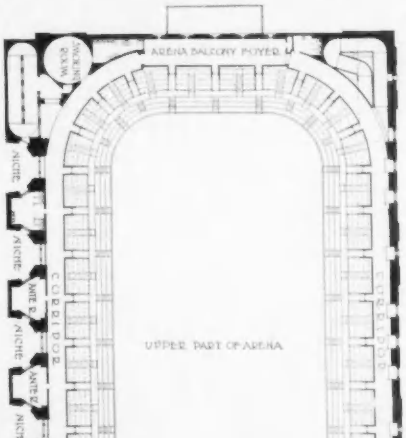
RICHARD E. SCHMIDT, GARDEN & MARTIN, ARCHITECTS



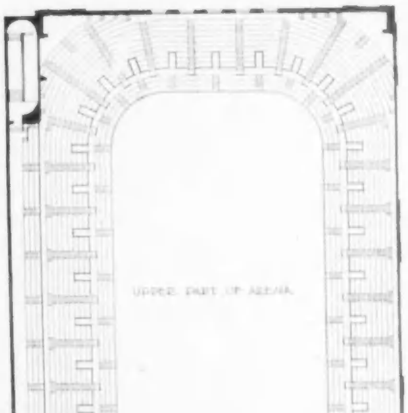
GENERAL VIEW OF NORTH AND WEST ELEVATIONS



FIRST FLOOR PLAN



SECOND FLOOR PLAN

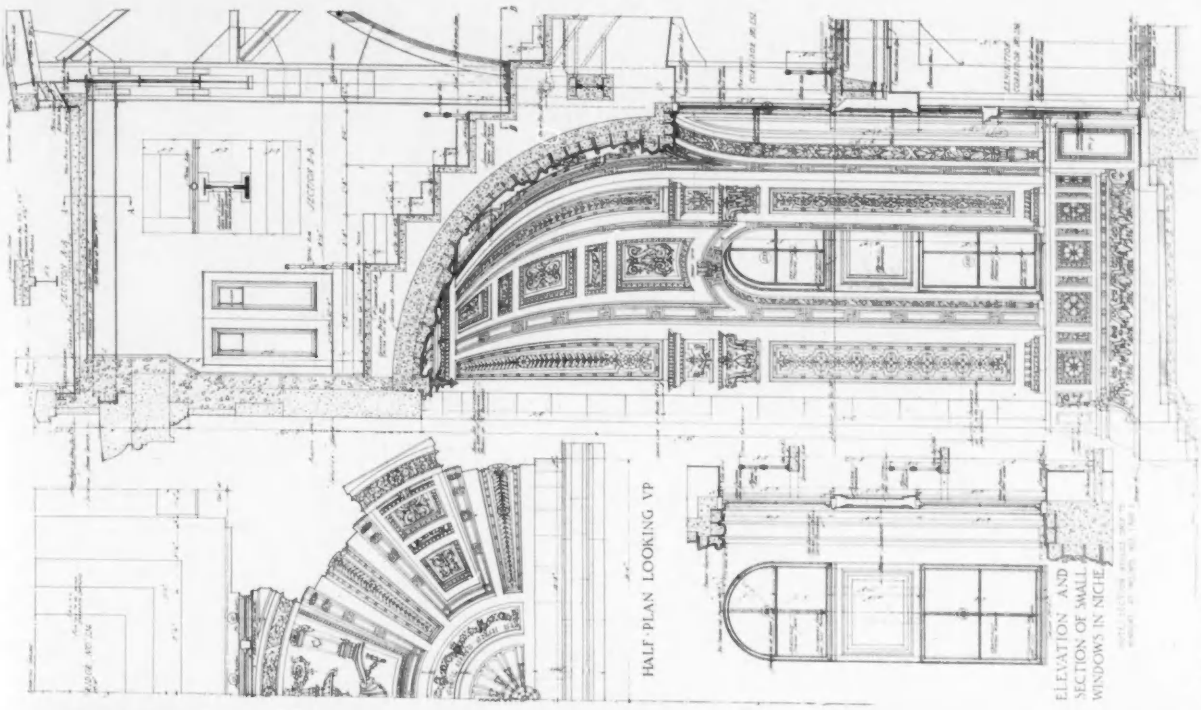


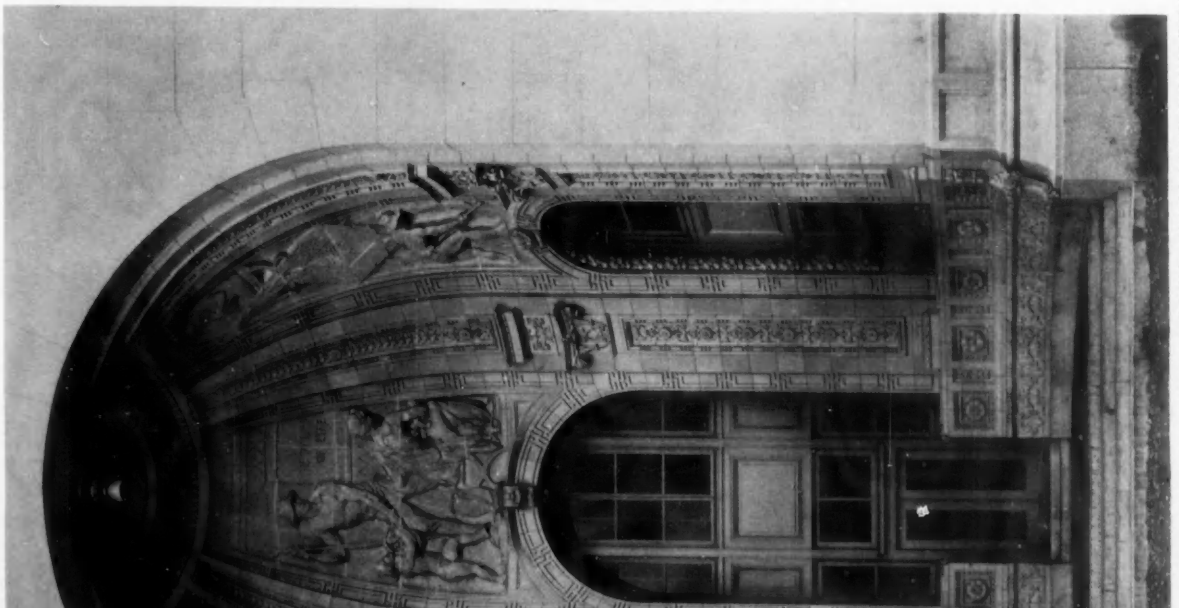
THIRD FLOOR PLAN

OAKLAND AUDITORIUM, OAKLAND, CAL.

JOHN J. DONOVAN, ARCHITECT

HENRY HORNBOSTEL, CONSULTING ARCHITECT



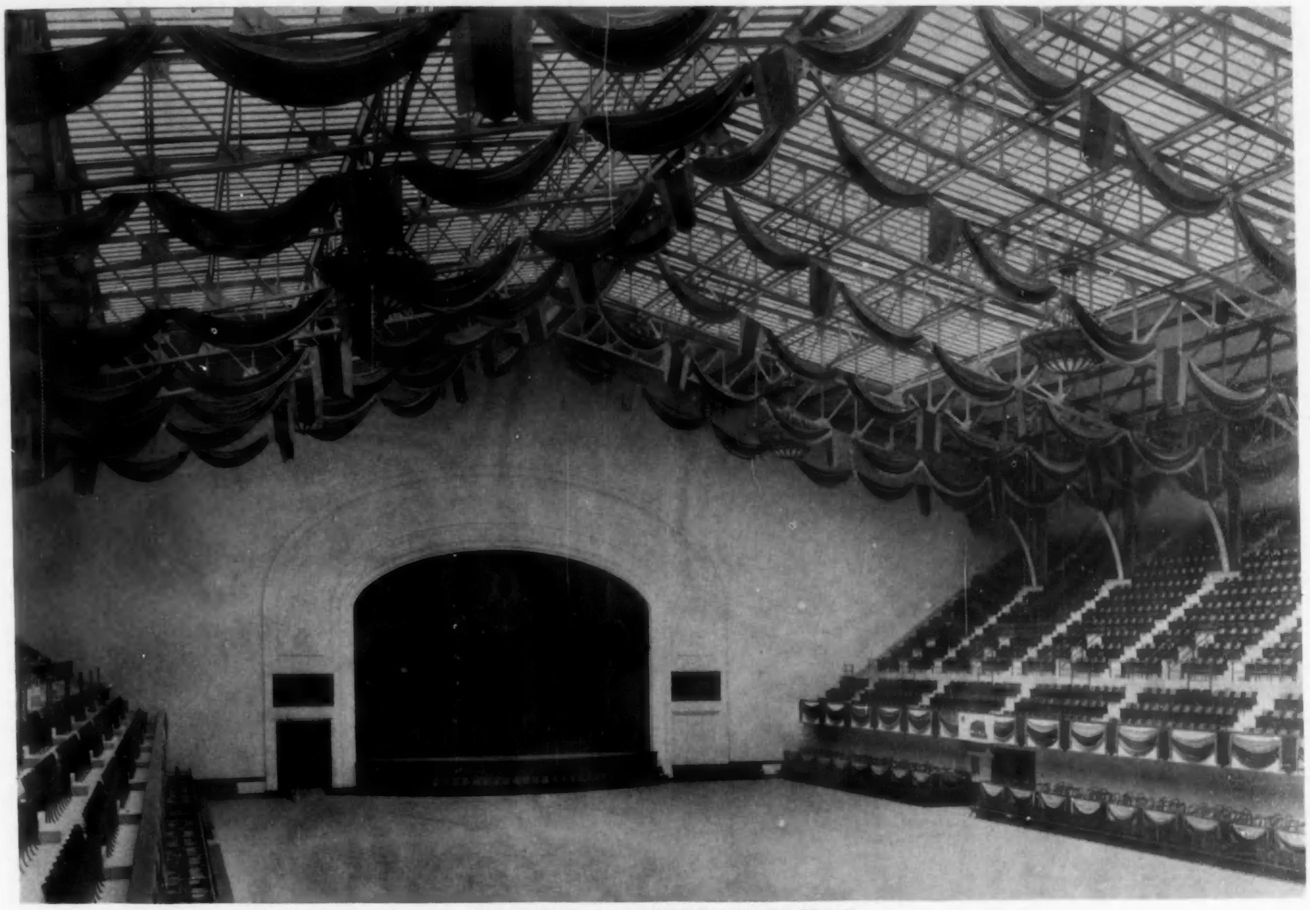


DETAILS OF NICHE AND SCULPTURAL FIGURES PORTRAYING "THE DUTIES OF LIFE"

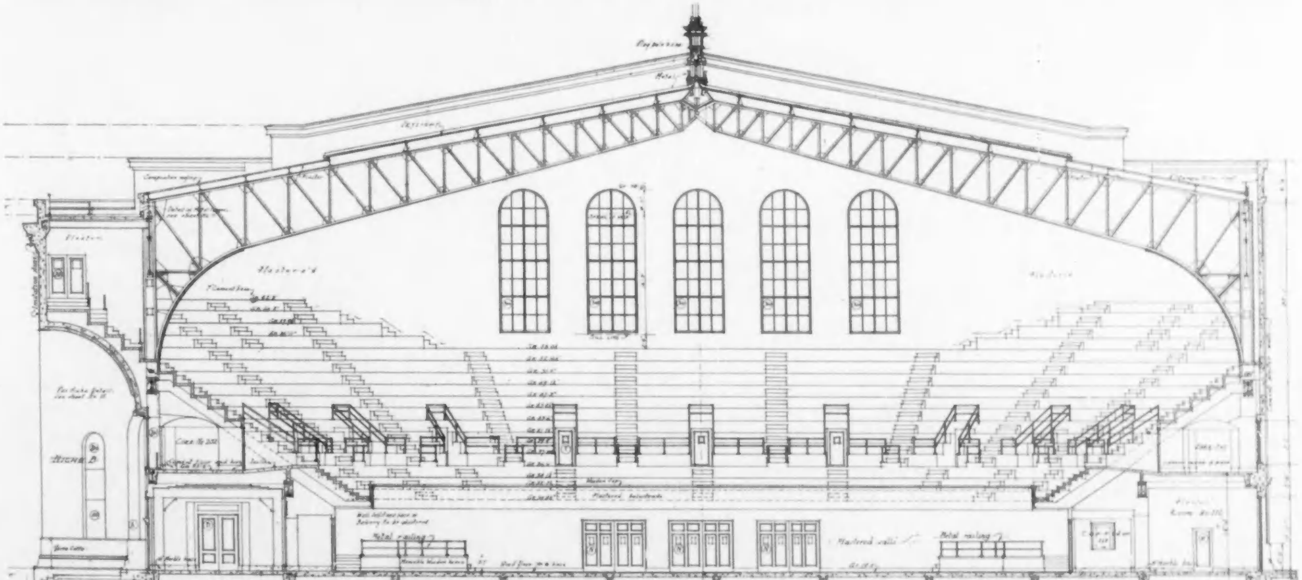
OAKLAND AUDITORIUM, OAKLAND, CAL.

JOHN J. DONOVAN, ARCHITECT

HENRY HORNBOSTEL, CONSULTING ARCHITECT



VIEW OF ARENA LOOKING TOWARD STAGE

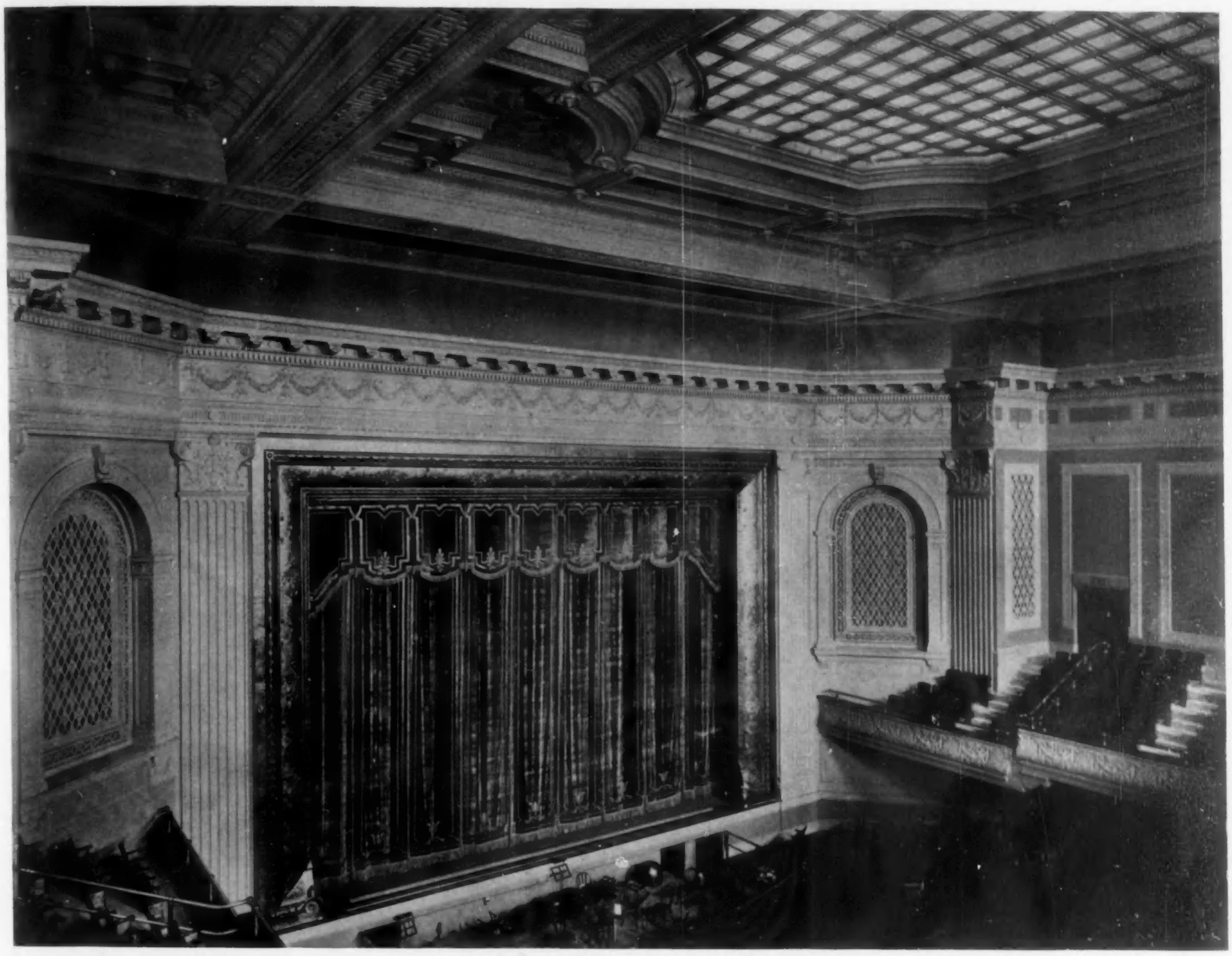


CROSS SECTION THROUGH ARENA LOOKING TOWARD REAR

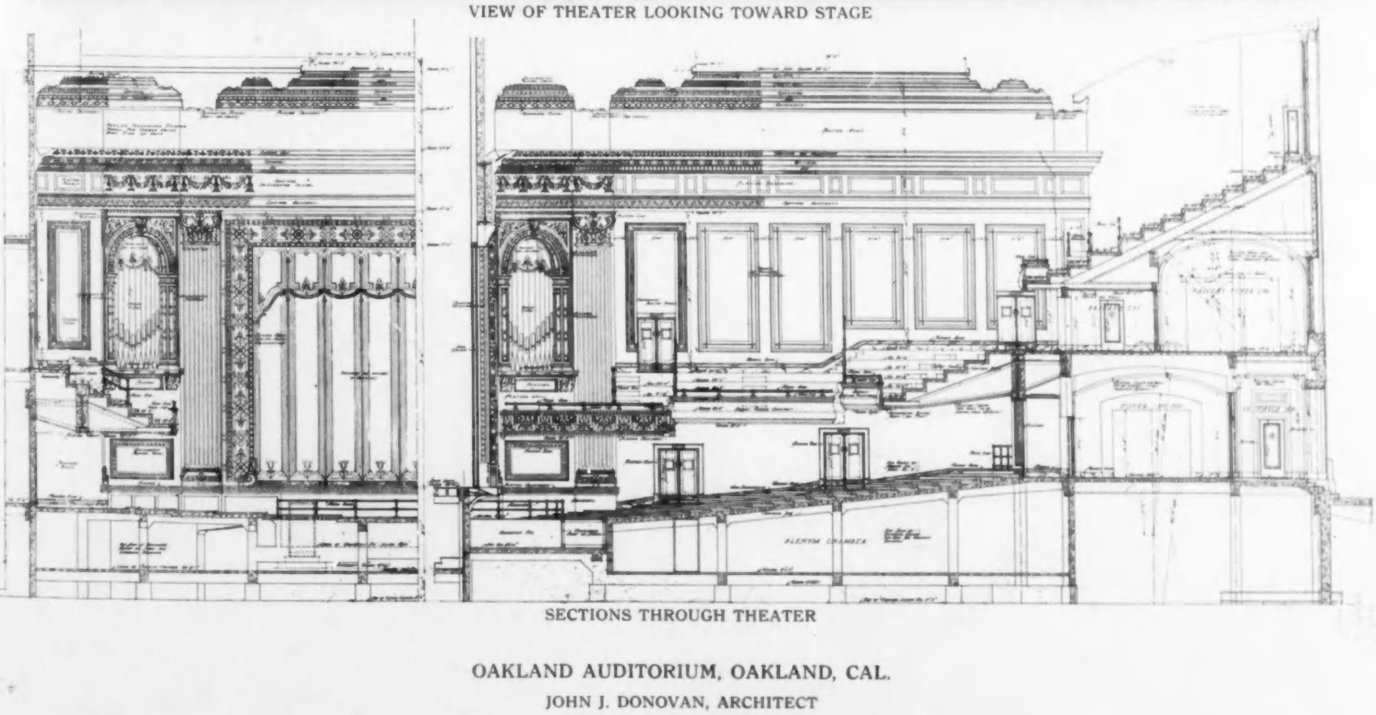
OAKLAND AUDITORIUM, OAKLAND, CAL.

JOHN J. DONOVAN, ARCHITECT

HENRY HORNBOSTEL, CONSULTING ARCHITECT



VIEW OF THEATER LOOKING TOWARD STAGE



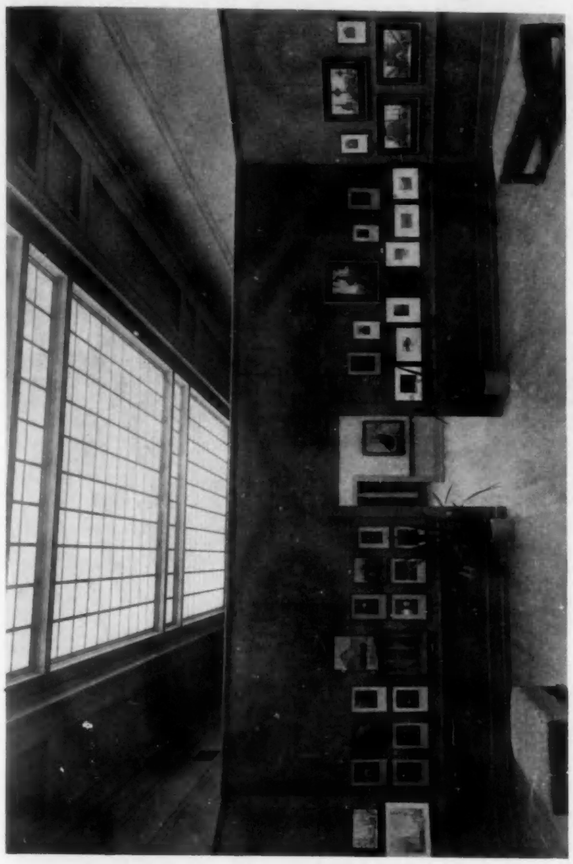
SECTIONS THROUGH THEATER

OAKLAND AUDITORIUM, OAKLAND, CAL.

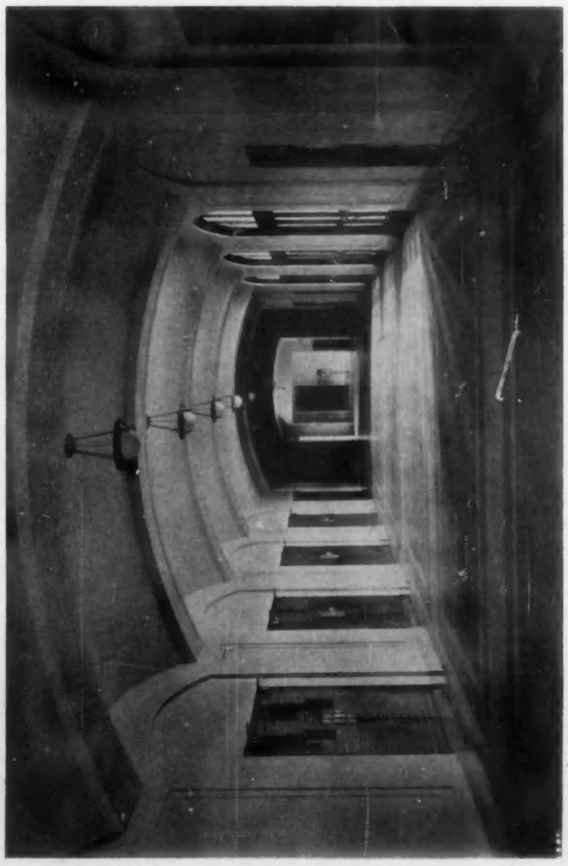
JOHN J. DONOVAN, ARCHITECT

HENRY HORNBOSTEL, CONSULTING ARCHITECT

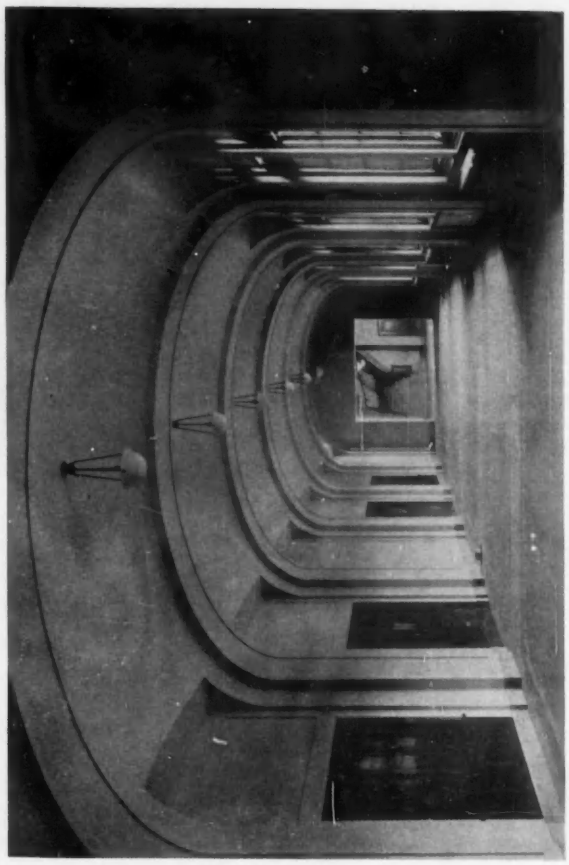
SMALL BANQUET ROOM



ART GALLERY



FIRST FLOOR THEATER FOYER



THEATER BALCONY FOYER

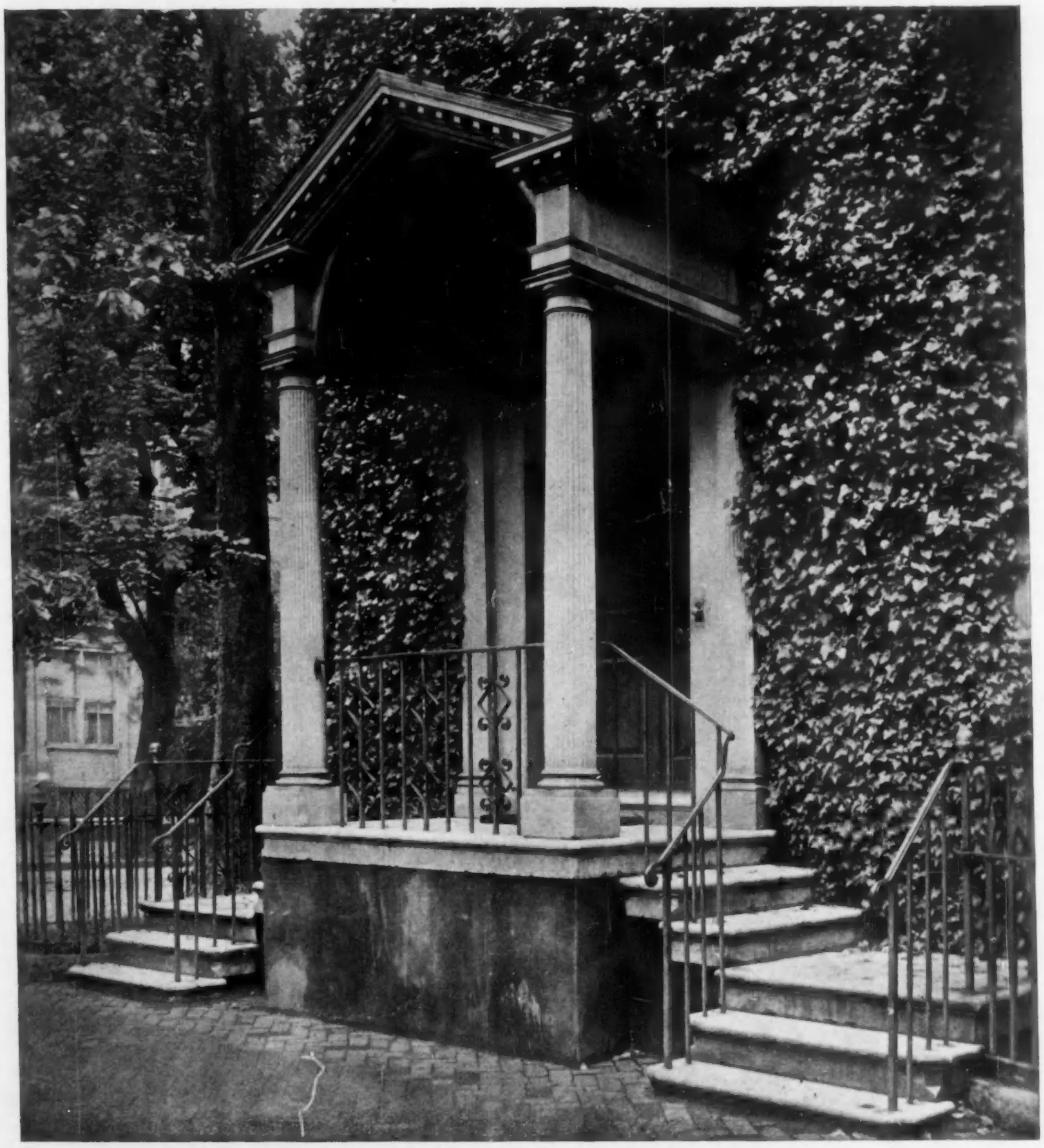
OAKLAND AUDITORIUM, OAKLAND, CAL.

JOHN J. DONOVAN, ARCHITECT

HENRY HORNBOSTEL, CONSULTING ARCHITECT

THE BRICKBVILDER COLLECTION OF

EARLY AMERICAN ARCHITECTURAL DETAILS.



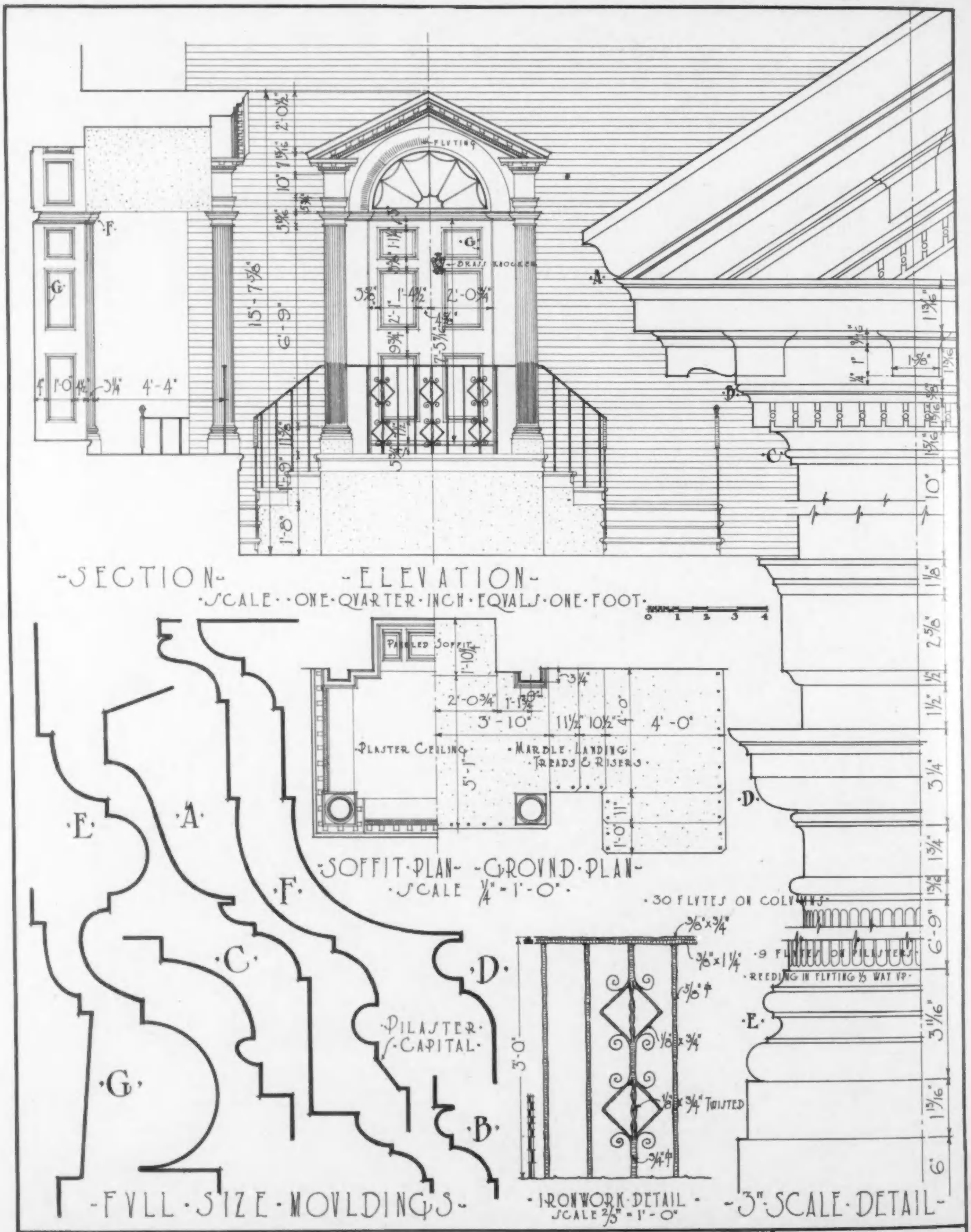
BUILT in 1791 by Moses Myers, the Barton-Myers house is perhaps the best Colonial residence to be found in Norfolk. The doorway here illustrated is typical of the Norfolk work and is a most excellent example of the Colonial style. White marble steps with a well executed wrought iron railing lead up to the entrance from either side. The delicately fluted Doric columns, with reeding extending one-third way up their height, support an entablature of characteristic Colonial mouldings.

Attention is directed to the naive treatment of the pilaster capitals where the omission of the necking and a change in the moulding contours of the capital will be noted.

PORCH AND DOORWAY OF BARTON-MYERS HOUSE, NORFOLK, VA.

Built in 1791.

MEASURED DRAWING ON FOLLOWING PAGE.



·PLATE·30·	·DOORWAY·BARTON·MYERS·HOVSE· ·NORFOLK·VA·	·MEASVRED·&·DRAWN· ·BY·
·OCTOBER·1916·	·DATE·1791· ·BVILT·BY·MOSES·MYERS·	·J·L·KEISTER·

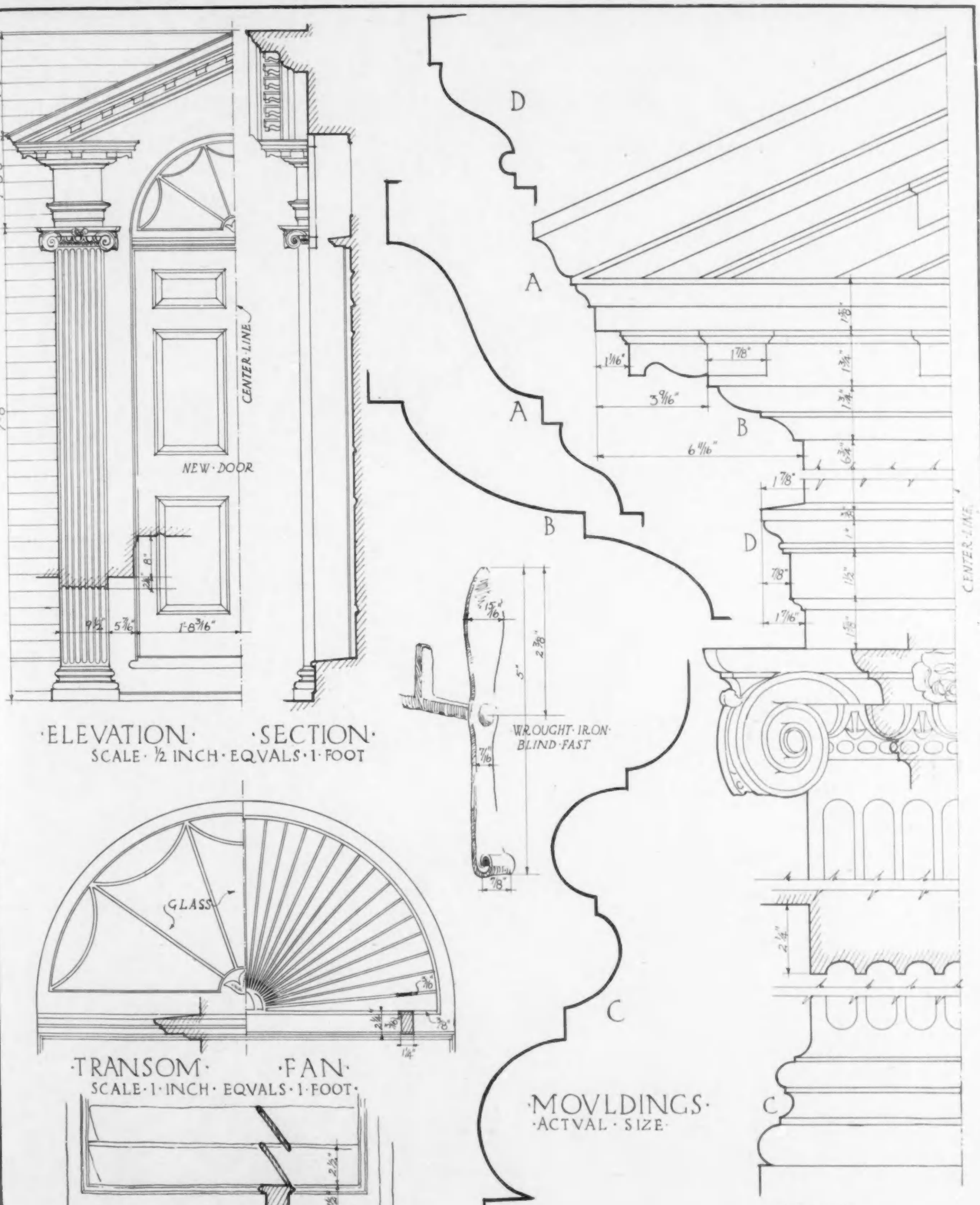


PLATE 31 OCTOBER · 1916	·DOORWAY·HODGES·WEBB·MEEK·HOVSE· ·DATE 1800· SALEM·MASS·	MEASVRED · & DRAWN · BY · GORDON · ROBB·

DOORWAY OF HODGES-WEBB-MEEK HOUSE, SALEM, MASS.

Built in 1800.

Decorative Plaster Work.

I. THE WORK OF THE GREEKS AND ROMANS.

By A. D. F. HAMLIN.
Professor of the History of Architecture, Columbia University.

THE beginnings of the art of plastering are lost in the mists of prehistoric antiquity, but its genesis is not hard to guess. With the earliest efforts of primitive man to construct a weather-proof shelter, whether of saplings and osiers, or of sun dried brick, or of stone, he must have applied mud or clay to the interstices of his hut to close them equally against the weather and against prying eyes. When at some later period of primitive civilization he discovered the properties of limestone that had been burned by his fires and then slaked in water, he took the first step toward the evolution of a new art. The admixture of sand and of hair or straw to give it a firmer consistency led to the practice of spreading it over the whole surface of his walls, at least of his interior walls, whereby they were made smooth and white and beautiful to look upon. With the discovery of pigments that could be applied to the plaster came the beginnings of mural painting, and plastering entered into its first definite service of the fine arts.

Pompeian Stucco Reliefs in Stabian Baths

In these earliest phases of the use of plaster we note the two uses to which it was applied throughout all classical antiquity; to the covering of interior walls with a uniform plane surface; and to the coating of rough or coarse grained stone with a fine surface for exterior effect. Just how early and where the first steps were taken toward its use for modeled or relief decoration is not known; but wherever it originated — perhaps in Greece or southern Italy — this third use of the material was carried to the highest perfection by the Romans, and later revived in the Renaissance, to be developed in new directions, as will be shown in another article.

So far as actual historical examples go, the Egyptians were the first people to put lime or gypsum plaster to artistic use. As far back as in the time of the Pyramid builders, some 3500 years or more B.C., they had learned to spread a thin coat of fine gypsum plaster over the surface of their masonry, upon which to paint the pictures which formed their chief decoration, both for interiors and exteriors. This plaster was composed chiefly of gypsum or "plaster of Paris," which is a sulphate of calcium, ordinary lime being a hydrated carbonate of calcium. The outlines of the painted decorations were incised, cutting through the plaster which was never very thick. In the dry climate of Egypt there was no danger of its flaking off, as it would surely do exposed to the varying temperatures and humidity of a more northern climate. This fine plaster was also applied as a sizing to wooden objects, obliterating the grain and the joints, and offering a smooth, white surface to the painter's brush.

Whether the Chaldæans, or the Accadians and Sumerians before them, used lime or gypsum plaster earlier than the Egyptians it is impossible to know. Remains of Chaldæan plastered walls, however, have been found of an antiquity rivaling that of the Pyramid-builders, and it is highly probable that in a land in which, as in Chaldæa, clay is the only generally available building material, some means would have been found very early of covering the walls of sun-dried clay with a decorative coat. The difficulty would be the scarcity of limestone, which would have to be brought down from the high table-lands of northern Assyria, and of fuel to burn it with. Plaster, therefore, was a rare and precious material, as was encaustic tile; rugs or hangings, and alabaster slabs richly carved were quite as common. Moreover, the complete collapse of the Babylonian and Assyrian palaces, with the soaking and crumbling of their clay walls and vaults, has destroyed almost every vestige of their plastering. Enough has been found, nevertheless, to show that white plaster was in use for two or three thousand years in the Tigro-Euphrates valley as a finished surface to receive painted decoration.

Another ancient civilization which developed a remarkable art of decoration in or on plaster was that of Crete, with its Ægean branches in Troy, Mycenæ and Tiryns.

The discoveries of the last fifteen or twenty years at Knossos, Hagia Triada, and other Cretan cities and the earlier excavations of Schliemann and others at Mycenæ and Tiryns reveal the use of white plaster with painted decorations as far back as 1800 or 2000 B.C. A highly developed decorative art grew up in Crete and spread thence to Mycenæ and Tiryns. Human figures, bulls, and other subjects were represented with great naturalism and dramatic vigor of action. The composition of this early Ægean plaster I am unable to give; it was probably a lime plaster.

Hellenic Greece received the art of plastering as a tradition, either brought from the primitive Hellenic home, wherever that was, or inherited from the Mycenæan-Tirynthian culture. The Greeks developed it, as they did everything they touched, along lines of high æsthetic beauty. The first use was, as in Egypt, to cover over the rough surface of the masonry of coarse poros stone with a fine, smooth, hard coating on which color could be applied where necessary. After the general adoption of marble as the proper material for temples, the use of plaster and stucco was less common in such buildings, but it probably continued in use for houses and the lesser sort of public buildings, which were commonly of rough rubble or of sun dried bricks.

One of the most singular uses of hard plaster was for decorative floorings. Traces of this use have been found in Egypt; but the most remarkable example is that uncovered by the German explorers of Olympia in the early eighties. In the Temple of Zeus Panhellenios there was found a floor of very hard plaster, decorated in black and white with an elaborate series of panels separated by complex meander borders, and containing each a mythological grotesque or figure. This, however, remains the only example of the sort thus far discovered in Greece.

If the remains of Greek plaster work are scanty, those of Roman plaster work are very abundant and very striking. It was the Romans who exalted plaster into something more than a merely subordinate element in architectural design, and made it a medium for the most varied and splendid forms of artistic expression. This was doubtless in great measure due to Greeks in Roman employ, but it was accomplished to meet Roman requirements, under Roman direction, and to satisfy Roman taste. That the results were universally so charming, so refined, so original, and so beautiful, should go far to refute the slurs quite frequently cast on Roman art and Roman taste. Our American art is no less American because much of it has been the work of foreign artists and artisans domiciled among us; and the Roman *stuccatura* is Roman art and not Greek art, though much of it may have been wrought by Greek hands.

Plaster decoration was an inevitable accompaniment of the Roman structural system. In Rome and throughout Italy generally, brick, rubble, and a species of coarse concrete were the chief materials for walls, and brick and concrete for vaults. Brick, terra cotta, and decorative tiles, which have been used by so many peoples, East and West in different ages, seem never to have been used by the Romans for decorative facings to their walls, either on the outside or inside. The Etruscan skill in modeling and coloring terra-cotta decorations for architecture disappeared as the use of marble increased in and after the time of Augustus, who "found Rome brick and left it marble." Marble facings and architectural details of marble were the universal dressing for exteriors of important buildings, and marble and plaster for the interiors.

Stucco Reliefs from the Farnesina Gardens

The quality of the Roman plaster was excellent and much of it has endured to our own day. It was applied in several coats upon a heavy ground coat of a sort of cement mortar, made of lime, sand, and *pozzolana* — a volcanic dust or powder with strong hydraulic qualities. For very heavy work finely pounded brick was mixed with the lime. For the finishing coat various compositions were used, — sand and lime, gypsum or plaster of Paris, and lime-and-marble dust. The finished plaster was rarely left plain; it was either painted or moulded in low relief, or both moulded and painted. There has been much discussion as to processes of painting — these will be referred to later.

All students of Roman art turn to Vitruvius for information as to the classic Roman practice; for the Ten Books on Architecture of Vitruvius Pollio were a text-book and compendium of all

the arts connected directly or indirectly with building. But it must be remembered that Vitruvius wrote in the Augustan Age, before Roman art had freed itself from dependence on Greek art; before architecture had attained its final maturity under the Flavian and Antonine emperors. We need not suppose that the rules he lays down were by any means universally observed. They were book rules, or digests of standard Greek writings on building. Yet they undoubtedly give an idea of the minute care exercised by the plasterers of Rome, both in his time and for a century or more afterward. The slaking and ripening of the lime were matters of sedulous care, as they are to this day in Italy and the Mediterranean countries. Pliny in his "Natural History" declares that no lime should be used that has not been slaked for at least three years! This rule would hardly find favor with American builders, and is doubtless an extreme requirement; but in the East to this day the lime pit is dug and the lime slaking begun while the foundations are being excavated, so that the lime may be "ripe" when the plastering is begun a year or two later. It is first slaked in shallow troughs, constantly hoed and stirred until smooth like cream, and then emptied into the adjacent pit. When the pit is nearly full, the lime is covered over with earth, often over a preliminary layer of cow-dung or other manure, and so left to ripen for months or years before using. This is undoubtedly a direct inheritance from the old Greek and Roman tradition. Vitruvius gives minute instructions for testing the lime after slaking. The final criterion is the adhesion of the lime to the metal of a hoe used like an ax; if the metal comes out clean from the lime, it is not yet tempered; "it is weak and thirsty, but when the lime is rich and properly slaked, it will adhere to the tool like glue" (Vitr., VII, 2, 2). In a later paragraph he specifies the running of the moldings first, then a "very rough rendering coat . . . and afterward, when the rendering coat gets pretty dry, spread upon it layers of sand mortar," exactly worked to plummet, rule, and square. A second and a third coat are applied, each as the preceding dries, and he insists on the necessity of care and thoroughness in these "foundation" coats. The plaster is now ready for the "mixture for the powdered marble"— he does not specify its composition. Three coats of powdered marble are applied, presumably mixed into gypsum plaster or fine lime plaster, and each is rubbed down, the last coat being the finest. The colors are applied to the plaster while still wet, that is, they are true fresco.

The limits of this article do not permit further quotations from Vitruvius; the curious reader is referred to the excellent edition of Vitruvius as translated by the late Professor Morgan of Harvard, and illustrated by Prof. H. L. Warren of the Harvard School of Architecture.

The Roman art of plaster decoration was probably derived from the Greeks; but the resemblance of much of this work, even of the first century A.D., to Etruscan terra cottas of the same period suggests that it was not by any means all of Greek workmanship. Probably the earliest examples extant are those in or from Pompeii, where painting and modeling in relief were both practised with consummate skill. Much of this work dates from the reconstruction of Pompeii after the earthquake of 63 A.D., though there is not a little, especially of painted decoration, of an earlier date. But modeling in relief seems to have become a general practice in the first century A.D., both in Rome itself and in provincial cities like Pompeii and Herculaneum. The finest Pompeian reliefs are those of the Stabian Baths, though some very delicate gilded reliefs from the Tomb of Scaurus are of earlier date. By far the richest find of work of this sort was that made in 1879, in the gardens of the Villa Farnesina, in connection with the building of a new embankment wall on the west side of the Tiber. Excavations for this wall disclosed the long-buried ruins of a house, the walls of which were covered with stucco decorated both by paintings and reliefs of a quality equal to the finest of the Pompeian walls. Large sections of this decoration were successfully removed and set up in the Museo Nazionale (Museo delle Terme) adjacent to the Baths of Diocletian, and every fragment, however small, that could be rescued was saved and is now to be seen in that museum. Casts of the reliefs were made and have been widely distributed; the Victoria and Albert (South Kensington Museum has a complete set of these;* there are

Stucco Reliefs from the Farnesina Gardens

* In Bankart's "The Art of the Plasterer" (Batsford, London; Scribner's, New York, 1909) there are many admirable prints of examples from this collection.

a few at Columbia University and in other American collections.

These "Farnesina" reliefs are gems of the modeler's art. They appear to have been worked free hand in the wet plaster — a process requiring the utmost dexterity and fine artistic feeling. The relief is very low, and the figures are modeled with surprising grace and correctness of drawing. Infant genii, swans, griffins, nymphs, Victories, and monsters figure in these decorations, most of them from a fallen vault, though some of them probably adorned panels on the walls. The painted walls are less showy but more refined in design and execution than the Pompeian walls, with little suggestion of the fantastic architecture so prominent in the later Pompeian work, and less glaring contrasts of color.

Some tombs on the Via Latina, one especially, are adorned with delicate reliefs in *stucco duro*, as the hard, finishing plaster of the Romans is called; these reliefs are set out in color and are second only to those of the Farnesina house in quality. In the finest of these tombs the barrel vault is laid out in circular medallions framed in delicate, enriched mouldings, with subordinate rectangular panels in the spaces between them. Each medallion and each panel contains a figure or group of mythological subjects, and exquisitely delicate scrolls in very low relief wander among these panels. Border compositions occupy the end walls under the vault. Another tomb has a groined vault with low reliefs in panels and end-wall decorations quite like the "Third Style" of Pompeian wall painting; it is less delicate, less charming than the tomb first described.

When Titus built his baths on the Esquiline Hill, he prepared the site by tearing down the extravagant "Golden House" of Nero and building among the piers which supported the platform and basement of that palace the piers which were to carry the new Thermæ. All these piers still exist, forming a labyrinth of brick masonry and vaulting, and all were originally covered with, and still in large measure retain, decorations in stucco of the finest quality. All this building, demolition, and rebuilding took place between 50 and 80 A.D., the golden age of Roman stucco work. These decorations in combined color and relief are of the most charming character and of the freest and most fanciful design of arabesque.

There are many other remains of Roman plaster work on the Palatine Hill, in the ruins of the Villa of Hadrian at Tivoli, in the débris of Roman villas on the Campagna, and doubtless elsewhere in Italy. This paper has done no more than call attention to a few of the most noted examples. The curious reader is referred to Bankart's work on "The Art of the Plasterer," to Volume I of the Sturgis-Frothingham "History of Architecture," to Gusman's work on Roman Decorative Art (in French), to Mau's "Pompeii," translated by Professor Kelsey, and to other works to be found in the Avery at Columbia University, and other large libraries on decorative art.

Roman Stuccoed Vault in Tomb on Via Latina

PLATE DESCRIPTION.

Bancroft Hotel, Saginaw, Mich. Plates 159–161. This building is located at the corner of Genessee and Washington avenues, with a frontage of 160 feet on the former and 140 feet on the latter thoroughfare. An addition to the south on Washington avenue contains seven stores on the first floor and above a roof garden. The Washington avenue side of the hotel is also devoted to stores on the first floor. The three-story addition at the end of the other façade is occupied by the Board of Trade on the first floor and by hotel offices and bedrooms on the upper floors. The main dining room together with the smaller coffee room and private dining room and the large banquet room on the second floor are conveniently arranged with reference to the kitchen, which is placed in the rear of the first floor.

The upper floors are given over to guest rooms which number 208, 131 having private baths and the remainder running water. The rooms on the second floor are arranged to serve chiefly as sample rooms.

Illinois Central Hospital, Chicago, Ill. Plates 162–164. The site occupied by this hospital has a frontage of 470 feet, with an average depth of 225 feet, which provided a good opportunity for a satisfactory grouping of the buildings. While the present group provides for but 111 patients, future buildings will give a total capacity of 250 patients' beds and 150 nurses' and help's beds.

The service that the hospital performs is primarily the treatment of the sick and injured employees of the Illinois Central Railroad. This fact makes it largely a hospital for men and from 65 per cent to 75 per cent surgical, and is also responsible for the variations in plan from that of the usual hospital, chief among them the large amount of recreation space and the small number of private rooms. The size of the wards is considerably smaller than usual, the largest having but four beds.

The entrance lobby divides the building into three parts, as a glance at the plan will show. The upper floors naturally divide themselves into similar units, each having its own toilet and utility rooms with services common to all at the crossing. Here the freight and passenger elevators, stairs, serving pantry, nurses' station, linen rooms, etc., are located. Service from the kitchen is by means of electric dumbwaiters. The nurses' station is so situated as to control the entire floor and is equipped at one side with a large steel medicine case with a sink and illuminated annunciator box.

On the second floor at the end of the west wing is the isolation unit of two small rooms with connecting bath. These may be arranged to provide one to five beds, and in case of an epidemic the entire wing of fifteen beds could be used.

The third floor is similar to the second, with the exception that the west wing is devoted to the operating department and that there are fewer private rooms. The operating suite has gray vitreous tile floors with terrazzo base and plaster walls, the latter painted a light olive green and the ceiling a cream white. The rooms at night are lighted by rows of lamps and reflectors set in steel boxes flush with the walls and ceilings and outlining the operating room windows.

For the ambulatory patients a suite of recreation rooms is arranged on the fourth floor. Over the entire south wing on this level there is a solarium with a quarry-tiled promenade deck. A small serving pantry, toilet room, etc., complete the arrangements on this floor.

In the basement are the kitchen and its accessories. This is a two-story room with exposure on opposite sides, insuring the best of natural ventilation, which is supplemented by a complete mechanical exhaust system.

The power house is an entirely distinct building connected with the hospital by a commodious pipe tunnel along the north wall of the west wing. This tunnel also serves as a passage between buildings for laundry and supplies, etc.

Oakland Auditorium, Oakland, Cal. Plates 165–169. This municipal structure for the housing of large public gatherings was promoted by the Chamber of Commerce and the various improvement clubs in the city of Oakland. It is ideally located on a large area that will later be improved with drives, lawns, and shrubs to form a part of the Lake Merritt Park system. The object in planning the Auditorium was to provide accommodation for every form of public gathering, from a small dance to the largest theatrical production and national convention. The building is 400 feet in length by 200 feet in width and rests on 2,200 piles ranging from 70 to 90 feet in length.

The main façade is on the north and contains seven niches of sculptural work by A. Sterling Calder, executed in architectural terra cotta.

The interior is divided into an arena and a theater, having a total seating capacity of more than 10,000, and separated by a stage which can be used together or divided by asbestos curtains for the use of either section. The arena has a floor space of 111 feet by 216 feet, with balconies and galleries extending on both sides and across the end and reached by run-way inclines. From the floor of the arena to the apex of the roof is 90 feet, the balconies running from within 15 feet of the floor to the eaves of the building, and in this entire space there is not a single supporting column or obstruction, the roof being carried by three-hinged steel arches designed like a spider's web. The floor is equipped with portable seats which are stored in the basement when not desired. Between the niches in the north corridor are alcoves with storage facilities from which refreshment concessions are operated.

The theater, located in the western end of the building, has a seating capacity of 2,000 people and contains an orchestra floor and two balconies. The interior has been decorated in plaster and bronze and finished in a harmonious color scheme through the efforts of Arthur Mathews, the artist who collaborated with the architect.

The stage has a width of 100 feet and a depth of 40 feet, and has a full modern equipment for the handling of all classes of productions. In addition to the arena and theater the Auditorium contains an art gallery, ball room, and two lecture rooms for the accommodation of small gatherings.

The architectural conception of the building is the work of Henry Hornbostel, who acted as consulting architect, during both design and construction periods.

EDITORIAL COMMENT AND NOTES FOR THE MONTH

THE name D. A. Gregg has been one to conjure with among the young men of the past two or three generations who have been striving to realize architectural ideals, and probably no one man exerted so powerful an influence upon the pictorial side of architecture as this very simple, unassuming, kind hearted man whose death came so recently as a surprise to all who knew him and appreciated the wonderful work he had done. We have but to pick up any architectural publication prior to 1880 to have borne in on us how crude were the methods of architectural draftsmanship in those days and to appreciate how much one man's ability along just one line of architectural manifestation was felt by the whole profession. Architecture is by no means a trick of rendering pictures of buildings; but just because the architect's conception far outspeeds his means of graphic representation, so an advance in methods and character of drawing helped far more in the production of good architecture than is sometimes appreciated. Mr. Gregg came into the profession of architecture in 1879. Aside from Mr. Hughson Hawley, there was then hardly a man in the country who made a business of architectural rendering. The methods of photographic reproduction were just beginning to be commercially available and line drawings were essential. Most of the perspectives in the architectural magazines of those days were made with T square and triangle and were marvels of utterly uninteresting distortion of effect. Mr. Gregg was at first hardly better than his associates, but he speedily developed a style of his own and he was able to systematize, so to speak, his free hand work, with the result that in a very few years a Gregg drawing could always be recognized. It was always good, and architects young and old sought first for his peculiar signature at the bottom of his drawings before even taking in the architecture. By the character of his work he aroused an interest in good architecture which was of incalculable benefit to the profession, and he made the illustrations in architectural magazines of permanent and positive value; and when a few years later he began to take up color, he evolved a scheme of rendering in flat tones with very slight accentuation of contours and with a thoroughly discriminating and keen sense of values which was a revelation and an entire innovation in architectural drawing. During the past twenty years or more his influence was greatly extended by reason of his connection with the Massachusetts Institute of Technology, and there is not an architect who has graduated from that institution but has profited by his instruction and his example. In every city in the country he has been associated with the pictorial representation of the best of architecture, the most interesting of the buildings. His life has been thoroughly well rounded out. During recent years he has taken less share in the work, but up to the very last his hand retained its cunning and his eye was quick to see and analyze the essential merits of an architectural design often dumped on him in very inchoate form by architects who knew if they once got Mr. Gregg to make the picture the building would be properly presented. And on competitions it was often a scramble to see who could first secure his services in rendering.

With all success he remained the simple, unaffected gentleman whom everybody loved and trusted; a man as pure in his personal point of view as in his drawing, as keen in his appreciation of the beautiful in life as the beautiful in line. He came from England a stranger. He built himself into the architectural history of the past thirty-five years, and to more than to any other of the many helpers that the architect has been able to call to his assistance does the profession owe a deep debt of gratitude to D. A. Gregg.

PARLIAMENT HOUSE COMPETITION.

THE Australian Government announces the resumption of the Architectural Competition to select the architect for the Parliament House in the new capital city. This competition was opened in June, 1914, and suspended in September, 1914, owing to the war, but is now reopened on the original conditions to all friendly countries (enemy subjects not being eligible), the date for receiving drawings being extended to Jan. 31, 1917, at London and Melbourne.

Programs can be obtained by application to the High Commissioner for Australia, 72 Victoria street, Westminster, London, or to the British Embassy at Washington.

Outline sketch designs only are required.

Eight prizes, aggregating £6,000, are offered, the first being £2,000.

An International Jury of the following architects is asked to make the awards: George T. Poole, Australia; Sir John J. Burnet, Great Britain; Victor Laloux, France; Louis H. Sullivan, U. S. A.; Eliel Saarinen, Russia.

BOOK NOTES.

The Relation of Sculpture to Architecture. By T. P. Bennett, A.R.I.B.A. Ill. 204 pages. 6½ x 9½ inches. London, Cambridge University Press; New York, G. P. Putnam's Sons. $4.50. To awaken a greater interest on the part of architects in relation to the sculpture for the adornment of buildings and to foster a more complete understanding between architect and sculptor is the purpose of the author of this book. He approaches his subject with a clear architectural sense that defines from the start the respective degrees of importance of these arts. He states frankly that it is quite possible to have beautiful modeling which may be utterly bad decoration from the architectural view-point. The sculptural and architectural forms should complement each other, and to attain this end the sculptor should translate his personality if necessary into the key adopted by the architect.